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(b) Communicate to parties interested, also as promptly as possible, the above information.

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of May and June 1913.

The Institute assumes no responsibility with regard to the opinions and the results of experiment Bulletin.

Notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Progress of Cereal Seed Selection in France

by

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Until the last few years the experiments on the production of the best seeds and their multiplication had been undertaken in France only by edsmen, who, however, were well qualified for the task. For the last century they have studied foreign products, especially the English, comparing them with the local varieties, and then, having made their choice, they gave those varieties which seemed to have a sure future before them to experienced farmers for reproduction on a large scale, after which they distributed them at first in the richest provinces and then throughout the whole of France.

The firm Vilmorin has always occupied the foremost position in this production of foreign seeds. The chief stages of this work are known by the detailed description of the varieties exhibited about the middle of the nineteenth century at the English, Belgian and French agricultural shows, and then by the publication, several times rearranged, of a *Catalogue méthodique et synonymique des Fromentis* (1850 and 1895) and of well illustrated volumes bearing the titles of *Les meilleurs blés* (1880) and *Supplément aux meilleurs blés* (1909). The firm Denaiffe at Carignan (Ardennes) has contributed to introduce the best varieties of oats; the work of Messrs. Denaiffe and Sirodot, *L'Avoine* (1901), completed in 1908, is a monograph presenting the greatest interest to farmers, merchants and biologists. Lastly, in several large agricultural centres the Experiment Stations publish regularly the results of their comparative tests of the novelties recently introduced in the country or imported from abroad. Thus M. Florimond espérez has summarized the results of his experiments in a series of pamphlets and articles under the title *Culture des différentes variétés d'avoine à la Station expérimentale de Cappelle (Nord)* (1888 and following years).

These publications have been very useful to the farmers of the North of France, of Flanders and of Belgian Hainaut.

On the other hand experimenters of great capacity and men of science among whom may be mentioned Louis and Henry Lévêque de Vilmorin, Schribaux, Gatellier, Philippe de Vilmorin, have contributed to keep awake in our country the desire of knowing the varieties most adapted to our soils. They would have continued and developed the works of Lecouteur in Jersey, of Desveaux at Angers, of Seringe and of Jordan at Lyons if the evolution of the seed trade and industry had not to a certain extent limited their intentions. The sale of grain on samples, the disappearance of markets, and the substitution of great mills for small local ones have brought in their train uniformity of prices and have caused the disappearance of that care with which the seeds of various qualities were studied and classified about the middle of the nineteenth century. The farmers of the last two generations only care to obtain as cheaply as possible the seed capable of giving the highest yield of crop to be sold by weight. The use of heavy dose of chemicals has created a demand for rapidly growing varieties with stiff straw and compact ears, capable of standing liberal nitrogenous manuring without lodging. Thus excellent local varieties were set aside on account of a single defect and the choice of new varieties was determined more by the absence of some defects than by the possession of real qualities. It may be said for the great bulk of our cereals that this is the system still prevailing.

Nevertheless it ought not to be forgotten that (excepting the resistance to intensive manuring) the aptitudes of varieties to give heavy crop have a notable influence on final results. In the United States, selection by pedigree with valuation of the lines according to their descendants (centgener power) has enabled Mr. W. N. Hays to replace *Fife* and *Blue stem* wheats by *Minnesota* No. 163 and *Minnesota* No. 169 derived from them. The average yield per acre was increased by 1 1/2 bushels, which signifies a yearly increase of crop estimated at a million dollars for Minnesota alone. Similarly in Sweden, according to the calculations of M. Nilsson-Ehle, the recent substitution of the pedigree wheat *Extra Squarehead II* for its parent *Extra Squarehead I*, which was already highly appreciated, gives an increase of yield of 15 per cent. It is thus highly advantageous from the only point of view at present taken by farming on a large scale, to adopt pedigree seed; but this subject has already been very well treated in the previous Bulletin by Messrs. N. Hjalmar Nilsson (1) and Nilson-Ehle (2) and I shall not insist further upon it.

The work done at Svalöf was not known in France before the commencement of this century. A pamphlet by M. Basil Macalik on *Hanna Boley* (1900) made the managing committee of the syndicate of French brewers

N. H. NILSSON: The Swedish Institute for the Improvement of Field Crops
B. June 1913, pp. 834-843.

NILSSON-EHLE: Improvement of Wheat and Oats at Svalöf. *Ibid.*, pp. 844-845.

acquainted with the methods followed at Svalöf; they considered it advisable to visit the Svalöf Seed Experiment Station and to introduce the Swedish pedigree varieties in some centres where good French barleys were raised (902). The malting of the pedigree barleys having given good industrial suits a *Society for Promoting the cultivation of Malting Barley in France* (903) undertook to carry out the following program: "1. Introduction into France of the Swedish pedigree varieties and surveillance over those lots which preserved their purity. 2. Separation from the best native varieties of pedigrees which might later replace the Swedish pedigrees".

The guaranteed capital of the new Society, upwards of £ 2000, was not utilized. The members defrayed the annual expenses of purchase, distribution and control of Swedish seed and the cost of research of native varieties by shares, the total of which was kept between £200 and £240. This slow method applied patiently during ten years had the result of preparing the majority of maltsters for this kind of work and of not alarming farmers, who mistrust any more or less interested initiative.

The success that attended the movement gained the support of the scientific institutions and of the Government. In 1908 the *Académie des sciences de Paris* granted the botanist of the Society a subvention from the *donaparte fund*, in consideration of "the great theoretical interest of his researches and of the important practical applications they will have". From 1909 to 1911 the *University of Paris* facilitated the extension of the work by a subvention from the Commerce Legacy; in 1912 the Minister of Agriculture granted the Society itself a subsidy. The *Institut Pasteur* at Paris hospitably offered the use of its laboratories and granaries for the study of plants during the winter, and an agricultural biological service was then created (1909) with a much larger programme, embracing research on all the cereals, on tobacco, fruit-trees and some other industrial plants. The processes of selection by pedigrees devised at Svalöf have since that time been applied to the selection of domestic animals as regards their productivity and resistance to disease.

The principal practical results obtained by this work on cereals, continued for ten years, are the following:

Among the Svalöf pedigree varieties which have given excellent results in France *Princess* barley deserves to be mentioned as foremost of

Its somewhat slow ripening is amply compensated in some districts by a remarkably high quality of grain and heavy yields. *Hannchen* barley ripens too early and soon degenerates in Champagne where Noll's *Bohemia* keeps its quality longer. *Chevalier II* barley of Svalöf does very well in Mayenne, where it has been grown for ten years; on the contrary, it has not been possible to keep *Primus* and *Svanhals* true, even in the North of France.

For this region the Society has prepared and studied with care the pedigree varieties selected from the local varieties. *Bourbourg* and *Cisterne*, of which it possesses several well tested lines, suit the fertile soils of Flanders, Belgian Hainaut and the country round Paris; but the profits that can be realized without great efforts from the growing of wheat will always keep the growing of pedigree barleys in

dary position notwithstanding the fact that the many maltsters of the country are disposed to pay handsomely for them. On the other hand the raising of native pedigree kinds has much developed in Haute Loire and Indre, in Maine, where a new pedigree barley *Comtesse* (0.117) thrives well in the neighbourhood of Saumur and in Aube, where the pedigree barley *Sarai* (0.156) has stepped into the front rank formerly held by *Bohemia*. In the centre, in Allier and Puy de Dôme, *Chevalier français III* (0.302), of the same origin as *Chevalier II* from Svalöf, succeeds better than the latter and yields heavier crops because it is later.

The problem of the improvement of wheat, especially from the theoretical point of view, is still in its preliminary stage; the selection of oats and rye do not seem to hold out any immediate prospect of utility in France. For fairly rich soils we have some good varieties of oats which are much esteemed on the markets, and the use of Svalöf pedigrees is recommended for rich soils. The acquisition of several early and medium-early large-grained maizes has not been followed by any demand for them on the part of the farmers and we are always more and more dependent on America for this cereal.

It must be recognized that the movement in favour of the pedigree varieties of cereals is still very limited, and that it has arisen without the active cooperation of farmers, who watch its progress with scepticism, if not with indifference; this depends without doubt on the subdivision of the land and of estates, on the still rudimentary education of farmers, and on the independence and easy life of the peasant proprietors, who sell their wheat at a high price. There is no demand in France for better seed on the part of farmers; what they find in abundance on the market seems good enough for them.

Swedish landowners are more highly educated and for the most part farm larger holdings; they are subject to a severer climate and have associated spontaneously with the object of soliciting the aid of competent botanists who have specialized in the study of one or more farm crops. Grouped into a Society to which they contribute their financial and moral support, they were not long in profiting largely by the discoveries, which every day become more important, made by their scientific fellow-workers. The Svalöf institutions, which thirty years ago constituted only a small private society, have drawn into their movement thousands of farmers of all the provinces of Sweden and represent a great national asset.

In France, the progress achieved is in reality only the result of the competition which causes evolution of the food industry.

Thus it is the directors of breweries, and the chemists familiar with the utilization of malt, who really select malting barleys in France. They alone can appreciate the value of pedigree lines among which the botanists would hesitate before making a final choice. The brewers then demand from the maltsters the necessary precautions to prevent the choice barley being mixed with others; these consent to make on their own estates the experiments of multiplication of those pedigree lines that the Society hands them in small quantities; they then increase their prices for all the lots, the purity and origin of which are guaranteed; it is only

y this surplus value of the crops that the farmers have been hitherto induced to respond to the invitations of the brewing industry. This transitory and still quite localised effort has had a very curious result: the high prices offered for the pedigree varieties available on the market have caused a rise in the prices of ordinary barleys, even the most common, of those districts; and this success, which was not foreseen, has allowed local farmers to realize considerable profits to the detriment, fortunately only temporary, of those who have spread the new methods and seeds.

In analysing the causes of the indifference of French farmers to the progress of the improvement of seeds, the following may be mentioned as the most important: the subdivision of the holdings, the affluence, or at least the easy circumstances, of the French peasant and farmer and especially their fear of the unknown, of experiments, and of that unsettledness which is so dangerous to small farms. The foresight and the doubts of our farmers, which are often called ignorance and spirit of routine, forcedly limit the efforts of the most enterprising merchants and of the most conducting industrial firms. Nevertheless, if the system at present adopted by the brewers endures long enough to offer some security to the farmers, there is no doubt that there will be a rapid and decided progress.

The industrial firms that purchase are decided to maintain their demands; the education that they have had gives them full confidence in the pure products that can only be guaranteed by the use of pedigree varieties. Having obtained unexpected results from the use of pure ferments, from the preliminary sterilization of worts discovered by Pasteur, they become enthusiastic partisans of the Svalöf methods based upon the same principles. The following are some other examples of the applications of the same method.

The problem of the economic production of wheat possessing high baking value, which causes such extensive work in Canada, in the United States, in England and in British India, is hardly known in France, and yet our millers pay American wheats, with which our markets are not always provided, five times their value; a small quantity of those wheats, suitably mixed vastly improves our spring wheat flours, which are almost all starch, and which are at present the most widely spread kind. It is under the indirect form of freeing our millers from American imports that the problem of improving French wheat will be presented. In 1909 the Director of Agriculture at the Ministry of Agriculture, M. Vassilière, requested me to examine the question under this aspect by preparing an inquiry on the varieties of wheat at present grown in France.

The selection commenced in 1908 by the Sugar Company of Bourdon corresponds very closely to the same object. The fertile plains of Auvergne which supply the Puy de Dôme sugar factories with sugar-beets are also an important centre for the production of semolina wheats which are bought at a premium by the Marseilles mills. The ever increasing extension of this industry has kept the prices of the raw material sufficiently high to render for the last thirty years the semi-hard long-strawed wheats, sown in the autumn after beets, one of the steadiest sources of nutritive

the district. The not very high prices of sugar during the last few years have not seriously affected the Bourdon sugar factories, who have convinced their clients that beets are an accessory crop which prepares the soil to produce good and highly remunerative wheat.

The problem of the improvement of Limagne wheats was put before me in 1908 in the following form. Is it possible to obtain from the Taganrog variety grown in the district for the Marseilles mills, lines maturing earlier than the varieties hitherto known, but equally productive and less liable to rust? I proposed to adopt the method of "pedigree culture" so judiciously used at Svalöf, and, without great expense, at the end of four years we obtained results which represent a considerable progress on the point of departure; of the six lines chosen as being decidedly superior to hundreds of others mixed with them only, one or two are to be grown on a large scale. But it must especially be remembered that the botanical selection of the Limagnes wheat has been undertaken by chemists and directors of sugar mills, men who have long been familiar with the technique of selection and with the statistical control of hereditary qualities; with the assistance of these competent men, progress has been rapid.

Our farmers, with their imperfect education, can hardly be reproached for showing a certain distrust of this form of sales and for entertaining the suspicion that the offered premiums conceal some snare. They have only recently protected themselves by special laws against frauds in the fertilizer trade and they are always threatened by the invasion of their markets by substitutes for milk, butter and even meat. But they will not resist the strong temptation to buy the best seeds and to raise from them the best crops of the district. Thus full confidence can be placed in the future of pedigree and guaranteed varieties. The security which results from their use and the higher value of their crops are two elements of success that cannot be weakened by some commercial agreement respecting the control of the produce that is delivered.

It is besides indispensable that the societies that distribute the seeds should analyse them regularly at every generation. They must prepare themselves to replace from time to time by new varieties those which no longer afford full satisfaction. This is done by the Svalöf Society for the Purchase and Sale of Seeds, and in France by the Society for Promoting the Cultivation of Malting Barleys.

After three successive attempts to introduce Svalöf *Princess* barley into Champagne, the managing committee was convinced that the crops would be only moderate in wet years and decidedly bad in dry ones. Farmers, grain-brokers, maltsters and brewers were all agreed upon this point, because the results obtained from pure seeds are always very marked. The Society thus did not have any difficulty in withdrawing from circulation and cultivation the products of *Princess* barley in Champagne, but the same barley succeeded so well in Indre that certain farmers managed to sell their crops as seed under another name and without submitting to analysis which is very severe. Maltsters who buy in that district recognize it at first sight, and the workmen who receive the bags or attend to

he steeping have no difficulty in separating it from other barleys. It is very interesting from a general as well as from a practical point of view to learn that *Princess* barley has not yet shown, after ten years of acclimatisation in a suitable district, any change in morphological and physiological characters, any degeneration or decrease in yield or in extract for the brewery.

Such is not always the case and this is the very reason of the compulsory yearly control to which the seeds of the Society must be submitted. Thus *Chevalier II* of Svalöf, which gave an average of good results, after eight years no longer deserved its name without a renewal of the seed. I have even been able to discover a very unexpected fact, which is of the greatest interest to the question of the fixity of hybrids. *Svanhals* barley, fixed and controlled at Svalöf, grown in Somme gave in two successive years segregations revealing its hybrid origin. This pedigree variety is recessive as to the character of the presence of spines on the flowering glumes; in Sweden it is table and with smooth glumes, while if grown on the dry and calcareous hill slopes of Picardy it gives a high percentage of grains with spines. The ears of this variety offer even a mosaic of smooth and spiny grains, which has led me to the discovery of "mosaic heredity" (1908 to 1912).

As soon as the Society for Promoting the Cultivation of Malting Barley in France became acquainted with this result in 1906 it had *Svanhals* barley withdrawn from the trade and from further tests, although it is a highly recommendable variety and much esteemed in the North of Europe. Similarly at Svalöf, but for other reasons, *Hvilling White Robsteier* and some other oats, which had a great success towards the end of last century, are no longer produced. According to L. Nilsson-Ehle *Grenadier* wheat is also doomed to disappear shortly. It will be said that this mode of proceeding has long been known, that it has been adopted by all firms dealing in cereal seeds. Certainly, but the facts that *Hvilling* oats are so easily and surely recognized and that Svalöf alone is qualified to sell them with guarantee, render it possible to withdraw this cereal from the market and to replace it rapidly by another more suitable pedigree variety.

The following is another very important advantage obtained: it is well known that agricultural centres are periodically threatened by epidemics, mostly fungoid diseases, which cause enormous losses. The recent general conviction is that the majority of these diseases are to a great extent spread by the use of infected seed. The introduction of pedigree seed must largely limit the danger of the spread of disease by the simple fact that very severe observations extending over a long time are necessary for their preparation. I have been able, in preparing native varieties for Champagne, to eliminate some very interesting pedigrees which were much less resistant to smut (*Ustilago*) than other pedigrees of the same origin. The very dry year 1911 rendered a great service in revealing which pedigrees were weakest from this point of view.

But the resistance to fungoid diseases, to cold, and to lodging is a function of the climate and soil; it is therefore to be feared that some kind of progressive deterioration, transferred to a distance from the locality in which they

studied, may become diseased or allow the germs of disease which they carry to become apparent. The increasing control at every generation of pedigree varieties reveals the danger and permits its avoidance. It is not more difficult for the societies that buy and sell pedigree seeds to withdraw from circulation the product of a few acres of rusty wheat than it is to suppress in Picardy *Svanhals* barley, which there does not preserve the morphological characters which allow of the yearly control as to its purity.

* The method of the preparation and diffusion of the varieties of pedigree cereals devised at Svalöf, and practised in Sweden and in France, allows the most important problems of modern agriculture to be solved. The increase of yield, the greater value of the product guaranteed to the industries that use it, the security of purchases and sales, the protection against diseases, are the principal, though not the only, advantages that French agriculture will reap from the use of pedigree seed, controlled at each generation.

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The State of Agricultural Plant Breeding in Austria

by

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The improvement of plants most commonly grown in farms commenced in the seventies. As in Germany, a few farmers started the movement and their work awoke interest in the subject.

A theory of the improvement of plants developed later. It began in Austria with von Proskowetz. In 1892 the first lecture in Austria on the improvement of agricultural plants was delivered by Fruwirth at the Higher School of Agriculture in Vienna and in 1900 the first publication on the theoretical bases and technique of general plant improvement was published. *Die Züchtung der Landwirtschaftlichen Kulturpflanzen* (Fruwirth).

Special plant improvement was developed later. At present Austria possesses two independent chairs for the teaching of plant improvement, one in Vienna at the Higher School of Agriculture (v. Tschermak), the other at Felschen-Liebwerd (Freundl).

Side by side with independent work in plant improvement carried out by individual farmers, work was also commenced in Germany by public institutions in conjunction with private individuals, mostly peasant farmers. Such cooperation was started in Bavaria by Kraus and in Austria in 1902 by v. Weinzierl at the Seed Control Station in Vienna.

The further development by Austrian investigators of the theory of the improvement of plants need not be discussed here; it is, however, worthy of note that an Austrian, v. Tschermak, took part in the rediscovery of the results of the researches of the monk of Brinn, Gregor Mendel, which have acquired such great importance in connection with the laws of heredity. In the review of the present state of plant improvement, which is the object of this paper, improvement by private persons will first be dealt with and then that by, or together with, public institutions.

The last publication on the improvement of plants in Austria was made in 1896 (1). As there was not then any so-called national plant breeding (*Landespflanzenzucht*) it limited itself to a description of the breeding farms of independent farmers. The names of one breeder of rye, one of barley, one of oats, five of potatoes and seven of sugar-beets are given. To these should be added v. Zelenski of Gradkowiec and F. Noll of Ober-Pöternitz in Bohemia not mentioned there; v. Zelenski began in Galicia in 1822 to improve Galician bearded wheat and Polish rye, which spread widely in Galicia. Noll began his work of improvement with barley and potatoes in 1887, but the results of his activity which were already then much esteemed, were not known in wider circles till later.

Of the 17 above-mentioned breeders, only six still continue to work. They are: v. Proskowetz at Kwaffitz, improvement of barley, sugar-beets and lately rye; Wohanka & Co., Prague, sugar-beets and, recently, mangolds; Dolkowski at Nowawies near Kenty, potatoes; Zapotil at Vetrusic, sugar-beets; Noll at Ober-Pöternitz, barley and potatoes; v. Zelenski of Gradkowiec, wheat and rye; and Hennings now at Herrenleis near Ladendorf, potatoes. The selection of sugar-beets has attained special importance for the supply of the home market, which however still takes up large quantities of seed raised in Germany.

The improvement of barley was the first to spread the reputation of Austrian plant breeding. The Hanna barley of v. Proskowetz, even when still simpler methods of selection were used than those at present employed, was much appreciated throughout Central Europe.

Another production that very soon obtained recognition abroad was that of the improved potatoes of Dolkowski of Nowawies. Besides Hanna

(1) *Landwirtschaftliche Pflanzenzüchtung und ihre Stätten in Oesterreich*. LEOWING, Vienna. Donau-Druck.

barley, Noll's improved barley was also much esteemed and like the former found its way to Hungary, Germany and France.

Since 1896 several breeding stations have been added to those mentioned above. Two of the new ones, devoted to the production and exportation of large quantities of seed, are specially important: the Central Establishment of the Noll and v. Dreger Breeding Association at Chlumetz and the Seed-Producing Farm at Loosdorf in Lower Austria. The former disposes of the original seeds of v. Lochow's and Strube's growth and of its own raising: Early Imperial, Bohemia and Earliest of All, Dreger's Bohemian Red Wheat and Dreger's Bearded Spring Wheat. The breeding of barley is carried out by Noll at Ober Poernitz, that of wheat by v. Dreger at Chlumetz. The seed farm at Loosdorf, which began breeding in 1903, is under the management of Director Schreyvogl and produce at present, besides wheats (Loosdorfer Red Bearded Winter Sb and Spring Sb), Lea, Maroh and Thaya barleys, as well as oats and rye. It has also commenced with margolds.

Besides these breeding establishments, several others work independently in Bohemia and Galicia. In Bohemia the Imperial and Royal domain of Jenc breeds wheat, Prince Schwarzenberg's estate Protivin since 1904 produces especially Bohemian wheat and also Bohemian rye and Probstei barley, Jiva at Vratno raises margolds, and the seed-breeding company Paulubitz since 1906 produces sugar-beets. Dr. Holy, at Stepanovic, has included in the field of his activity the production of grasses which until then has been completely neglected in Central Europe. In Galicia, Count Scipio, a Lopuszka, has been engaged since 1900 in the first place with Galician wheat of which two forms are bred, one bearded and the other beardless; then with Sandomierska, a local variety from Russian Poland. Two of his crosses endeavour to unite the good qualities of Galician wheat with those of Square head. In the same year breeding was begun at Mikulics. The landowner v. Dobczyz, at Turnau, has also bred several forms, from Galician wheat bearded and beardless, and two crosses of Galician wheat and Square head Lozinka and Binlka, besides rye, oats and four-rowed winter barley. Busczynski and Lazynski, a Russian firm, has been breeding sugar beets since 1886 at Niemiercze in Podolia and since 1905 also at Gorka Narodowa in Galicia. Three types, each for different conditions, are bred.

Breeding in connection with public institutions, so-called local plant breeding (Landespflanzenzucht), was begun first in Lower Austria. The director of the Seed Control Station in Vienna, v. Weinzierl, had already in 1887 attempted to obtain an improvement of the conditions of the production of seeds. The foundation of establishments for the cultivation of cereal seeds-corresponding to what are now called seed farms, was contemplated. The institution, however, had not fully satisfied its originator, and in 1902 a section for plant improvement (Inspector Pammer, Assistant Freudl) was added to the Seed Control Station. It commenced the breeding of plants of the locality on the technical lines of Neglisch of Dresden. Breeding was carried on in 10 centres, which by 1912, had become disconnected with large estates. Since 1910 all three sections of the

Seed Control Station have carried on breeding; to the raising of cereals the reeding of forage plants and of potatoes and maize have been added.

Cooperation with public institutions for the improvement of the plants the country is practised in Upper Austria, Bohemia, Styria, Moravia and Galicia.

In upper Austria the former president of the Agricultural Society, Herr Wienerer, took the greatest interest in plant improvement and arranged his farm at Otterbach as a breeding farm. It was a kind of central station for Upper Austria; it produced several cereals, seed of which was mostly distributed to peasant farmers. The owner subsequently gave up the work. Four large farms have partly independently and partly in connection with Otterbach begun to breed: v. Boschan's farm at Achleiten was the first to engage in the work.

Carinthia possesses since 1911 a breeding garden at Maria Saal, founded by the Provincial Agricultural Council.

In Bohemia the cooperation of public institutions of the Province commenced in 1911. In connection with the German section of the Provincial Agricultural Council, the chair of plant breeding of the Tetschen Gewerbeschule (Prof. Frendl) undertook the advisorship of three breeding farms: Postelberg (Prince Schwarzenberg) for wheat that may be sown in spring or autumn, and Hanna barley (since 1907), and two farms subvented by the Provincial Agricultural Council: Friedland (since 1906) for malting rye, and Duppau for oats (since 1909). In two of these, namely Friedland and Duppau, which are connected with peasant proprietors, the work of selection also has been undertaken by the above chair. In 1912 a fourth breeding station similarly subventioned was added to the list: Saaz, for malting barley. The advisorship of another breeding farm in Bohemia: Oberau (Schreiner), for rye and oats of the country, has been undertaken since 1907 by the 1st section of the Vienna Seed Control Station (Pammer).

The Czech section of the Provincial Agricultural Council began in 1914 to turn its attention to plant breeding. Wheat, rye, oats and barley were each to have had a medium-sized farm provided with all the necessary outfit and with technical direction. Of such stations only the Lončová station is still engaged upon oats. After several changes the improvement of wheat was undertaken by Prof. Jelinek, of Prague, that of rye by Dr. Babanel, of the School of Agriculture at Rokytzan; Prof. Munzar, nominated by the Provincial Agricultural Council to the post of director of improvement of the plants of the province, took over the institution for improvement of forage plants which had been founded in 1909 at Tabor by the Provincial Agricultural Council.

Styria has since 1908 adopted the cooperation of public institutions somewhat differently. At the Agricultural School of Grottenhof there is a seedling garden under the direction of the Seed Control Station of Graz (Dr. Hotter) which gives its selected seed to the school farm for multiplication, whence it passes to recognized seed farms; these grow it and sell it by means of the agricultural association of the province. In Styria, owing to the

two other breeding centres were instituted and placed under the same direction.

In Moravia the Czech section of the Provincial Agricultural Council has turned its attention to the breeding of Hanna barley. Already previously, at the suggestion of Prof. Macalik, an association had dealt with the breeding of this variety. The Provincial Agricultural Council has recognized in a series of experiments which were commenced in 1901, that the Kwafitz Hanna barley is the best, and arranges for it to be grown by 23 breeding stations in the province. At the agricultural school in Přerov, at the request of the Provincial Agricultural Council, the breeding of grasses has been begun by inspector Nevral. The German Moravian Agricultural Association deals with the breeding of Moravian mountain oats. The agricultural experiment station at Brünn, which under director Varka dealt chiefly with the improvement of barley, now under director Špíšar selects other plants also.

In Galicia plant breeding with the assistance of peasant farms has not been carried out. The agricultural association has entrusted the rector at Dublany, Mieczynski, with the task of advising the breeders of the province.

The attempts to introduce national plant selection are recent, so that the effects of the supply of seed to the peasant farmers on the agriculture of the country can not yet be felt. The national plant selection, so far as it is carried on with this cooperation of peasant owners, is mainly the task of working locally and for peasant owners. The preparation by peasant farmers of considerable quantities of uniform first-class original seed for the trade is rendered very difficult by the limited extent of their granaries and barns and conveniences for cleaning and selecting.

What can be attained by the so-called national plant breeding is a gradual supply to peasant neighbours of better seed than that used to the present. In those cases in which public institutions work together with the owners of large estates, the latter differ from independent selection farms only in the fact that the former can avail themselves of the assistance of the technical experts of the public institutions.

The independent breeding farmers of Austria have hitherto sufficiently provided the home market with selected seed and have also gained a footing abroad. What would still be desirable is that the owners of large and medium farms that do not select their seeds should value selected seed more highly than they do at present. The improvement of seed can attain far-reaching significance for the agriculture of the country besides the work of selection as such, the production of improved seed correspondingly developed. At present great demands are made on the seeds turned out by breeding establishments, which the breeder can satisfy by the high condition of his fields, granaries and barns and the development of his mechanical arrangements for cleaning and grading seed. In this respect also the large seed-breeding farms of the Austrian independent producers occupy a high position.

The majority of Austrian breeders have found since last year in the Austrian Association for Plant Selection a representative of their interests. This association, which considers the improvement of the technique of plant selection as one of its chief aims, has started a Breeder's Book, in which, after examination of the farm by a commission, the corresponding selections are entered. This provision is copied from the breeding register (Hochschlagsregister) of the Deutsche Landwirtschafts Gesellschaft and is intended to protect the products of the plant breeder and to guarantee the purchaser that the work of improvement is properly carried out by the breeder.

Agricultural Plant Breeding in Germany at the Present Day

by

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The breeding of agricultural plants in Germany has reached its present high state of development without State, or official, assistance. Its success is entirely due to the initiative of individual far-sighted agriculturists who have recognized the importance of improving cultivated plants by means of selection, and the satisfactory results of their labours prove how much can be effected in this direction by means of self-help. It is only recently that the Government, in some States where small holdings are the rule, has made arrangements by which the small farmer may enjoy the advantages of the work done in plant breeding.

Plant breeding in Germany began in the first ten years of the nineteenth century with the improvement of the mangold. In the middle of the century the threatened ruin of the potato industry caused by the potato blight led to the improvement of the potato, while that of the sugar-beet, though it had begun early in the century, was not practised to any extent until the middle of the nineteenth century. Cereal selection started latest of all, and, with the exception of a few isolated attempts, dates only from the middle of the sixties. Steiger (at Leutewitz) and v. Borries (at Eckendorf) may be regarded as the founders of mangold breeding in Germany, while the honour of being the first potato breeders falls to Elsner v. Gronow and Hansen (at Nassengrund). Klein Wanzleben is the birth place of German sugar-beet breeding, and Wilhelm Rimpau of Schlanstedt may be regarded as the father of cereal breeding in Germany. With the development of the cultivation of sugar-beet and the consequent adoption of intensive agricultural methods, plant selection became of greater importance, for the existing varieties were unable to profit by the improved conditions of cultivation; indeed in the case of cereals the yields were actually reduced owing to the lodging caused by better cultivation. Although more productive

varieties were imported from England, Denmark, France, etc., to meet the demand, they failed in many districts, showing clearly the importance of using properly acclimatized varieties, and very soon a few preliminary attempts were made to improve the new varieties by selection. These gradually extended and before long came to include most of the cultivated plants, though the improvement was unequal amongst the different species.

Mass-selection was adopted as the sole method of improving varieties and was applied to the reproductive organs: thus mangolds were selected for the shape of their seed glomerules; but later mass-selection was extended to the whole plant, and in the case of the mangold, to its dry matter and sugar content. This method of mass-selection, which is now no longer practised in plant-breeding, gave excellent results in the case of cereals, mangold and other plants, which have not been surpassed by more intensive and scientific methods and it is important to realize this fact in order to understand the first period of plant selection in Germany.

The new varieties produced at this time owe their existence, for the most part, to the isolation of certain types from amongst the old native varieties or to the propagation of new types showing deviations from the parent type (i.e. mutations), which deviations, being hereditary, facilitated the work of selection.

Modern selection of agricultural plants in Germany is based on the choice of individual whole plants, due regard being paid to all their important qualities. Such selected plants are grown and propagated separately and their breeding value is judged by their offspring. The real selection, therefore, is based on the plant's reproductive capacity; it is the capacity of the plant to produce good offspring which is called into question, and its appearance and exterior only serve as indices in selection until such a moment as its worth is proved by the quality of its descendants. Working in this manner the best pure lines are obtained where the plants are self-fertilizing (Johannsen), while in the case of cross-fertilized varieties a superior strain or a good family may be obtained by crossing similar plants and subsequently selecting the best individuals. A rigid selection must continually be practised, and in doing this, it must be borne in mind that cross-fertilized plants exhibit a considerable variability and even though the characteristics of the pure lines taken as a whole remain unchanged, nevertheless, even here, differences occur and may lead to modifications, either favourable or the reverse, which therefore should either be used to improve the variety, or eradicated to preserve the purity of the strain. As such deviations cannot always be detected from the external appearance, the testing of the offspring of the selected individuals cannot be entirely neglected even though it be not necessary to practise it regularly.

The continual selection of the best ("Deutsches Auslesenverfahren" Fruwirth) which the breeder formerly believed to be necessary in order to increase the productiveness of his variety, and which it was incumbent upon him to observe so long as he worked with mixed lines, is still useful.

The test of productiveness, as a rule, begins in the experimental breeding plot, where the descendants of the best plants are grown in equal and

possible, large numbers in adjoining rows and under similar conditions. The offspring which prove to be weak, little resistant, or in any other way undesirable, are weeded out, the rest being further tested in the field in order to obtain as soon as possible an exact knowledge as to their cropping powers and other important economic qualities. The practice of judging individual plants by points given for as large a number of characteristics as possible, is being superseded by the systematic testing of their descendants in the field. The former system served only to supply a basis for later comparisons and to avoid the necessity of detailed entries in the plant register. Much of the testing apparatus which was formerly considered indispensable, and in any case served to adorn the plant-breeders' laboratory, is now seldom used.

There are countless records of the success in *sugar-beet breeding* and the fame of this work has spread far beyond the borders of Germany itself; by its means a high yield and a high sugar content have been combined, and beets have been obtained which are remarkable for their hardiness and other useful qualities.

In *mangold breeding* the varieties combining a large yield and a high content of dry matter have been rather left behind by those which have been bred either for large yield alone (Eckendorf and numerous other varieties) or solely for a high dry matter content (Lanker, etc.). The combination of both qualities in a high degree has not yet been attained, though both have been remarkably developed in separate varieties. Mangolds with a high content of dry matter are valued chiefly for their superior keeping quality, and are therefore grown to supply the demand in spring, while those varieties which produce the large yield and whose keeping qualities only enable them to be used during the winter form the main part of the crop.

Cereal breeding is very widely distributed, owing to the large acreage usually under these crops. Numerous new varieties of all cereals have been created, partly by selection from foreign varieties adapted to the local conditions, and partly by working on indigenous varieties. Great success has been met with by breeders of wheat, barley and oats, but these have been surpassed by the performances of F. v. Lochow with rye at Petkus. We have cereals of all kinds suitable for the very varying climatic and soil conditions of Germany. Some are hardy and resistant, bearing fair crops under unfavourable circumstances, others are very productive but more exacting, whilst others again are mediocre as regards their yield and moderate in their requirements. This specialization has greatly increased the cereal crops and made them more certain, and its importance is in no wise lessened by the fact that some individual varieties can be successfully cultivated under many different conditions.

A special position is occupied by *potato breeding*. The new varieties of the potato which are placed on the market exceed in number all the other productions of agricultural plant breeding. The success of many of these new varieties is, however, but short-lived, relatively few of them being of any real worth; there are, nevertheless, sufficient of the latter to

supply the demand. The German potato-breeder has certainly done great service to agriculture; by his exertions the old varieties, which had deteriorated in productiveness and general hardiness have been superseded by new kinds which in many cases have proved of the greatest agricultural importance. This success has, almost without exception, been the result of crossing, and it is only quite recently that new varieties have been created by selecting the modified forms arising amongst old varieties, as in the method adopted by Lochow at Petkus. Whether the satisfactory result of this practice is due to an unusual prevalence of bud-variation, or is to be attributed to other causes, cannot at present be determined.

Very satisfactory results have also been obtained in breeding Leguminosae; new and excellent varieties of peas and beans especially have been produced, occasionally by hybridization but more often by the use of mutants. Attention has also been paid now and again to the improvement and creation of new varieties of other members of the order, *e. g.* lupins.

The selective improvement of forage plants (clovers and grasses) is still in its infancy, but the attempts, which have been made in this direction through the isolation of types are so promising that there is no doubt this work will soon be crowned with success, in spite of the technical difficulties which impede it.

Little worth notice has been effected in the breeding of other agricultural plants; in not a few cases (French beans, carrots, cabbages, etc.) gardeners have so long occupied themselves with their improvement that there is little cause for the agriculturist to concern himself with the matter. It should, however, be mentioned that the breeding of vines has advanced from the theoretical to the practical stage.

A good idea of the condition of plant breeding in Germany, in so far as the number of breeders is concerned, can be gathered from the review written by Dr. Hillmann at the request of the *Deutsche Landwirtschafts Gesellschaft* (German Agricultural Society) and entitled "Die deutsche Pflanzenzucht" (Works of the D. L. G., No. 168). According to this there were in 1910: 34 breeders of winter rye, 3 of spring rye, 61 of winter wheat, 23 of spring wheat, 5 of winter barley, 60 of spring barley, 53 of oats, 23 of mangolds, 31 of sugar-beets, 17 of potatoes, 4 of cabbages, feeding carrots, etc., 8 of clovers and grasses and 28 of pulse. Although these figures can lay no claim to absolute accuracy, yet they give some idea of the extent of plant-breeding activity in German agricultural circles, and reflect the relative importance of the different classes of agricultural plants.

We have already mentioned before reasons for the limited extent of selection carried on amongst clover and grasses, but a few breeders could soon supply the country's needs as regards the improvement of many of these forage plants (*e. g.* grasses).

If plant selection has reached its present eminence in Germany without State aid, the fact must not be overlooked that its success and far-reaching

tivity are largely due to the effectual assistance of the *Deutsche Landwirtschafts-Gesellschaft*. The service which the latter has done to plant-breeding in Germany is by no means lessened by the fact that later, other agricultural corporations, unions, and associations (*Gesellschaft zur Förderung Deutscher Pflanzenzucht*, *Bund der Landwirte*, *Landwirtschaftskammern*) have worked on the same, or similar lines, for the first-named association took the lead in systematic and successful work in this field of labour. By its comparative field tests in all parts of Germany, the D. L. G. has, above all, contributed to elucidate the question of varieties, and to propagate the most valuable of these. Recently this branch of the work has been placed on a broader basis by the extension of the area for agricultural experiments through the intervention of the Chambers of Agriculture and by the establishment of smaller testing stations, mostly under the direction of scientific institutes, where the new varieties may be submitted to a preliminary sorting before proceeding to the larger field trials. These field trials of the D. L. G. have, for a long time, been supplemented by the potato-growing experiments of the *Deutschen Kartoffelkulturstation* and the barley-growing experiments of the *Versuchs- u. Lehranstalt für Brauerei* in Berlin.

Competitions for plant-breeding farms and associations have already been held ten times by the D. L. G., and have done much to promote, encourage and explain the work of selection, while the publication of the judgments passed on the various competitors has helped to distribute clear ideas as to the value of the methods and operations practised by different breeders. These competitions, which became increasingly difficult to organise as the number of breeding establishments grew larger, have been superseded by the institution of the D. L. G. *Hochzuchtregister für Pflanzzüchtungen* (Plant-breeding Register of the D. L. G.), in which can be entered the products of systematic breeding obtained within the German Empire. By "hochzucht" is meant the product of many years' systematic selection by one breeder or breeders' association, working according to a common plan, the pedigree and performance of which product is known from a plant register or from some other breeding document.

Systematic selection consists in the selection of individuals, either in pure or in connection with known crosses, and is based on the utilization of the continual variability of types. Every variety entered on the *Hochzuchtregister* must have a certain agricultural value based upon reliable variety trials. The entry is valid for 4 years, after which the variety must be reported and inspected in order to receive another certificate of eligibility. Being entered in the register entitles the variety to a patented label inscribed with "*Eingetragene D. L. G. Hochzucht*", which is a guarantee of pedigree value. At present, the following are registered in the *Hochzuchtregister*: 6 varieties of rye, 9 of wheat, 7 of barley, 6 of oats, 2 of peas, 1 field bean, 4 of potatoes, 6 of mangolds and 2 of sugar-beets.

All these regulations of the D. L. G. are made in the interests of the breeder or of the agriculturists, who obtain their seed from the former. The inspection of Seed Production, established in 1897, is of the greatest use to

those farmers who use ordinary trade seed. This institution undertake the examination of the condition of fields growing seed for the market and of the arrangements made for cleaning the seed, in order to determine whether the farm is capable of growing good seed, and especially whether the crops in the fields are pure-bred and of one single variety, as well as uniform and free from contagious diseases and dangerous weeds. The cleaning and grading of the seed is therefore controlled by the purchaser and recognised seed offers the buyer every security with regard to such properties as cannot be distinguished by inspection: further, the pedigree, the number of resowings from the original seed, the freedom from cross-pollination, etc., are also under control. This practice of inspection is in force now in the districts where there are chambers of agriculture or similar organizations; it is carried out either by these bodies themselves or more usually, by special associations.

The character of the undertakings varies; their chief aim is to promote the production of seed of varieties suitable to the district and the adaptation of these varieties to local conditions; the results obtained vary according to the manner in which the associations are managed; they have been especially successful where practical assistance has been obtained from scientific institutes or experts. As a model may be cited the organisation in Bavaria where all seed-producing associations are in close connection with the *Kgl. Bayerischen Saatzuchtanstalt* at Weihenstephan and are, so to speak, under its direction. A similar state of affairs occurs in Württemberg and in Baden where there are also State institutes for plant breeding: the *Kgl. Württembergische Saatzuchtanstalt* at Hohenheim and the *Grossherzogtl. Badensche Saatzuchtanstalt* at Hochburg, which encourage seed selection by their own work together with the assistance of local organizations. In other parts of Germany no institutes for the special purpose of plant breeding have yet been established. Here, almost without exception, the experimental and teaching institutes have included the selection of agricultural plants in their sphere of operations, thus taking the place of the State Institutes of Southern Germany. As the Agricultural Universities and Colleges instruct their students in plant breeding, both theoretical and practical, and in some places, e. g. at Jena, by submitting them to a seed inspector's examination give them an opportunity of proving that they are conversant with the principles of agricultural plant selection, the effect of such institutions upon the development of this industry is in no way to be despised. Moreover experience has proved that the decentralization of the work in this direction has great advantages. Certainly it is most desirable that some well-equipped experimental stations should be founded for the purpose of working out the principles of heredity, a clear understanding of which is of fundamental importance in practical plant breeding, for such problems can only be mastered by dint of systematic investigations requiring much labour and time, although individual effort can add its quota to the general sum of knowledge. The *Gesellschaft zur Förderung Deutscher Pflanzenzucht*, founded in 1908, exerts a considerable influence on the development of plant breeding. This society includes amongst its members practical breeders and the exponents of the different

sciences connected with plant breeding. It has successfully extended agricultural plant selection by means of various experiments and forwarded the interests of the breeders.

Thus a lively and increasing interest in the various branches of plant selection is apparent in all agricultural circles in Germany, and the results of the breeders' work receive the keenest appreciation amongst farmers, who readily turn to account the discoveries made by the experts. As a result, agricultural returns have increased and become steadier; but it is impossible to demonstrate this fact by statistics, as cultural methods have also contributed to the result. The more the success of plant selection can be made known to the peasant agriculturists, the greater will be its beneficial effect upon agriculture in Germany.

Present State of Forestry in Portugal

by

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Forest Legislation. — The law of December 24, 1901, and its regulations of December 24, 1903, mark an important step in the progress of forestry in Portugal, in virtue of the following measures :

Establishment of the principle that the receipts from the State forest are to form a special fund devoted exclusively to the cultivation, and working of the same forests and to reafforestation, leaving the State to pay the staff of the forest service.

Placing under the control of the forest service all the forests belonging to the communes, parishes and public establishments, as well as all the uncultivated lands which cannot be economically cultivated and the reforestation of which is recognized to be of public utility.

Obliging all landowners who possess lands and forests within the afforestation area declared to be of public utility, to submit to the control of the forest service under penalty of expropriation.

Permission granted to landowners whose properties are not included

in the reforestation areas to submit *partially* to the forest service or only to the forest police service (1).

Institution of a bureau for the management of forests and for research and experimentation in forestry.

The above law is followed up by the law of May 23, 1911, which fixes at 150 reis (about $7\frac{1}{2}$ d) per ton, the tax on the exportation of props for mines, and provides that 70 per cent. of the yield of this tax be allotted to the special fund of the Forest and Waters Department, at the same time obliging the latter to grant yearly prizes to those teachers of primary schools who have distinguished themselves in the teaching of forestry or in organizing school or mutual forest associations.

Lastly, the recent organisation of the agricultural service of August 17, 1912, is to be mentioned. It divides the country into agricultural districts and forest belts and creates in each district an agricultural station entrusted with the study of the local agricultural conditions, the establishment of experiment fields and of alpine gardens and the spread of instruction by object lessons. In each of these stations the agents of the Forest and Waters Service play an important part.

Direct action of the State — The provisions of the law of 1901 have had an immediate effect upon the forest services of the State. The Department of Forests and Waters, on the strength of a guaranteed fixed annual budget, independent of parliamentary votes, has been able, since 1903, after deduction of the expenses required for the cultivation and exploitation of the State forests, to devote its revenues to the reforestation of the dunes and mountains, as well as to the improvement of waste lands and moors which the communes, through want of funds, cannot reforest.

The result has been the yearly reforestation by the State of nearly 1750 acres of waste lands situated on the mountains and on the shifting

(1) The law establishes the obligatory control by the forest service and the optional submission to the same. The control is obligatory for the State forests, for those of public bodies and even for those of private owners when they are situated within the areas of afforestation declared to be of public utility. It is optional for all private forests not situated in the above areas.

The control of the forest service is complete for the State forests, and partial for those belonging to communes and parishes and for private properties included in the afforestation areas.

It is either partial or a simple forest police service for those estates which the owners voluntarily submit to forest control.

The two first, total and partial, differ from each other in the object aimed at by the systems of management, which are always submitted to the approval of the State.

The simple forest police control is less strict; it barely obliges the owner to preserve his forests and to reforest his uncultivated land in a generally sufficiently long period without determining the extent to be reforested every year.

The advantages offered by the State to private owners submitting to partial control are naturally greater than those offered to the owners who submit only to the simple forest police control.

(Author's note).

sands of the coast, since the mission of the State is generally to undertake the most onerous work.

This constant average will increase from the year 1913, thanks to the supplement of revenue which the export duty on mine props will yield to the Department of Forests and Waters. Nevertheless it must not be forgotten that the yearly increase of the area of the forest domain entails greater outlay for planting and surveillance, and consequently the increase of the extent benefited cannot be strictly proportional to the increase of revenue.

The institution of a Bureau for forest management, research and experimentation, allowing of greater uniformity in these studies, marks a great progress from the point of view of scientific research and of the exploitation of State forests. The results of these investigations and observations are always slow in the matter of forestry; still, it is confidently believed that in one of the next forestry congresses Portugal will be able to present important studies on the maritime pine, its growth and conditions of cultivation and on the acclimatisation of exotic trees, following the instructions adopted by the International Union of Forest Research.

Indirect action of the State. — The indirect action of the State, which is an immediate consequence of the existing laws, takes the following forms: Supply of ornamental trees to municipalities for avenues and public parks and squares, and of forest trees to communes and landowners whose estates are under partial forest control and who may avail themselves of the services of forest officials for reafforestation and exploitation work. Landowners whose lands or woods are not comprized in the reafforestation area are allowed to submit them to the partial forest control or to the forest police service on presentation of the plans of their holdings, which plans may be made, at their request, by the forest officials. Landowners have besides the right of reserving their shooting and fishing rights and of keeping at their own expense duly sworn forest-guards appointed by the State, without being obliged to prosecute evil-doers, which is done by the State; reafforested lands are exempted from the payment of taxes for twenty years, and rewards are given to teachers of primary schools who in the course of the year, have deserved well of the forests of the country.

Action of the Communes and of public institutions. — Not much can be expected from the direct action of the communes, all of which are more or less short of financial resources with which to meet the expense of reafforestation. In general, and with but few exceptions, most of their landed property, which may be estimated at about five million acres, is neither cultivated nor wooded, notwithstanding the fact that from the very first years of the existence of the kingdom of Portugal, Royal Orders were incessantly issued with the object of preserving the forests and ensuring reafforestation of waste lands. Nothing has been able to prevent deforestation, due to the woodman's axe, excessive grazing and the forest fires caused by shepherds.

Only a very few communes or public bodies have been in a position since 1904 to include in their budgets the sums required for reafforestation. On the other hand the number of communes which every year requests

the State to undertake the work is constantly increasing. This has been provided for by the law which admits the following arrangements being made:

As soon as the submission of communal lands or forests to forest control has been approved by decree, as well as the plan of reafforestation or of management, the municipalities must declare within 30 days from the publication of the decrees in the Official Gazette which process of reafforestation they prefer and which may be one of the following :

1. Reafforestation and management carried out by the Forest Service at the expense of the State, the municipalities having the right to a part of the net returns.

2. Reafforestation and management carried out at the expense of the municipalities which alone enjoy the returns.

3. Reafforestation and management carried out jointly by the State and by the municipality.

Without entering into details, it will be sufficient to say that for the adoption of the first process it is indispensable that the municipalities prove that they do not dispose of the funds required to meet the cost of reafforestation; in this case the division of the net returns between the State and the municipality is made proportionally to the value of the communal land before its improvement and to the outlay of the State for reafforestation, the salaries of the officials not included.

Private enterprise. — The above-mentioned law has been generally well received by the owners of woods and of lands to be reafforested. Of all the advantages offered by the law, and which have been enumerated above under the heading "Indirect action of the State", those which have been most welcome are the right of shooting over the property and the protection against poachers and other marauders, for owing to want of means, the municipalities have never established a properly organized rural police, which in fact it may be said does not exist in the country.

Statistics show that since 1904 (the Regulation of the law of 1901 was not approved until December 24, 1903) the acreage of holdings submitted to forest control is already considerable : that the communal and private property submitted to partial forest control is 74 550 acres, and the private property submitted to forest police control is 259 000 acres.

The enormous difference between the acreage of private property submitted to partial forest control and that submitted to the simple police control shows that the legislators, well knowing the aversion that landowners entertain against contributing a yearly fixed sum for the purpose of carrying out plans of reafforestation or management, both duly approved by decree, have wished to lead them to engage themselves voluntarily, in consideration of certain advantages, to the conservation of their woodlands and to the reafforestation of their waste lands within a period of time fixed somewhat *ad lib.* As this is only allowed in the optional forest control, the results show that the legislators were right, in as much as they remembered that he who wants everything ends by getting nothing.

Progress of forestry. — We must not confine ourselves only to the study of the yearly increase of the forest domain of the State and of the communal and private properties under forest control, in order to ascertain—in default of other statistical data—to what extent the wooded area of the country increases. There is also an indirect way and a very important one, namely that of the trade in the seeds of maritime pine, the applications for which addressed to the Department of Forests and Waters increase yearly in importance, while traders, in view of the greater demand for this seed, have raised their prices.

Having no other trustworthy data beyond those which can be drawn from the applications addressed to the State, we can state that the latter has supplied this year enough seed to reforest about 7400 acres of waste land, considering that with few exceptions the regeneration of maritime pine forests takes place naturally even after clean felling.

Besides this important fact, it is also a matter of rejoicing that this year, March 9, Arbor Day has been celebrated with enthusiasm by the municipalities and the teachers of primary schools, who, in the villages, have most contributed to its success. Lastly, especial mention must be made of the association of the Lovers of Trees, which owing to the great number of its members is destined to play a great part in the forest policy of the country, as has been the case with similar associations in other countries.

Causes of reforestation. — It would be a mistake to attribute all the merit of the movement which has set in in favour of reforestation to the better comprehension of its utility, to the propaganda which has been carried on in its favour and to the action of the State. It is necessary also to seek the economic causes which have been at work. They are the enhanced value of forest products, the increased mileage of our railways and roads, the greater demands of trade and of the industries; the greater value of cork, the exportation of mine props to England, the spread throughout the country of the resin industry. These are the principal factors which have increased the value of the maritime pine forests and have attracted to them the attention of capitalists.

This forest tree is always the one preferred. It is very robust, not requiring in its cultivation, soil or aspect, thriving up to 2700 feet and reaching up to 4000 feet; it is of great value owing to the facility with which all its products can be disposed of. Such is not yet the case with *Eucalyptus*, the exotic tree most widely spread in Portugal: of rapid growth, attaining enormous dimensions while still very young, thriving equally well in almost every kind of soil, still the various industries hesitate to use it because its wood splits and cracks in drying and consequently it does not sell easily. *Acacia lanoxydon*, on the contrary, though more exacting as to soil and aspect and less widely spread, develops also very rapidly and is very much appreciated for carpenter's work. Both these foreign trees shoot freely from stool.

Forest wealth of the country. — The following forest species constitute the stands, which cover 19 per cent. of the total area of the country. They occupy the following acreage:

Maritime pine and umbrella pine, the former prevailing	1 909 663 acres
Evergreen oak	898 833 "
Cork oak	817 081 "
Chestnut	210 345 "
Pedunculate oak, Pyrenean oak and Portugal oak	169 150 "
	4 005 072 acres

Geographical distribution of the forest trees. — The valley of the Tag which roughly divides the country into two large agricultural regions separates also the principal forest belts.

To the south of this river the vast region of the plains extends, which the rains are less abundant and the climate warmer. That is the home of the oaks with evergreen foliage, which are met with on both banks of river.

To the north is the mountainous region; its climate is not so dry, rains being more abundant. In it maritime pine prevails, its area extending also on the left bank of the river, following its course as far as its mouth where it descends somewhat towards the south along the shores of the Atlantic. This region is also the habitat of chestnuts and of deciduous oaks. They also descend towards the south, but on the opposite side of the country along the Spanish frontier on the more broken ground and at the great altitude.

Methods of forestry. — From the cultural point of view there is nothing of great interest to be said. Green manuring and chemical fertilizers, which are already so extensively used in farming, have only been tried as experiments by the Forest Service.

The forests of maritime pine are cultivated as follows:

In the north, where property is much divided and agriculture intense and where the farmers use reeds as manure, the method of selection felling is the one that answers best to the requirements of the district. In the centre where the stands are denser, thinnings which are fairly well conducted followed by clean felling in private forests when the trees are between 40 and 80 years old. In the neighbourhood of Lisbon and of the other large centres of population, selection felling is again met with in conjunction with pruning. The high prices that the branches provided with their need for fetch for baking purposes, are the cause of the choice of this method, which ensures owners a high fixed annual revenue.

Forests submitted to this system are generally divided into 4, 5 or 6 felling, all of the same extent, of which one is worked every year leaving the tops of the trees with barely 4 or 5 whorls.

When the trees are pruned, which is the chief object, selection felling is practised, leaving aside those trees capable of producing building timber or those which are over shaded and fit only for fire wood, which commands a high price. The cover is thus kept fairly clear, so as to allow of spontaneous regeneration and of the free development of young branches.

The State forests properly managed, in view of their greater yield, are submitted to a rotation of 80 to 90 years.

The evergreen oak which elsewhere is mixed with cork oak, forms great lands, the wood and bark of which are not utilized. Its fruit supports numerous herds of swine which feed upon the acorns under its cover. It is calculated that 19 bushels of acorns of the evergreen oak are sufficient to fatten a pig, whilst it requires nearly 23 of cork oak acorns. The fattening of pigs is undoubtedly one of the principal resources of the country to the south of the Tagus.

The cork oak, the bark of which forms one of the most important branches of the export trade, is stripped of its cork every 9 to 10 years in the plains, and every 11 to 12 years on the mountain slopes.

These two oaks, the source of so much wealth and which are only sparingly exploited when they are sickly, are carefully tended and subjected to generally well-conducted pruning, which yields fire wood to the whole of the south of Portugal where the growing of wheat prevails. Their production is not obtained by replanting or by artificial sowing; it is left to nature and only protected by man.

Deciduous oaks are seldom seen as high forest, but mostly as coppice, and it is only mixed with other forest trees or standing isolated that some deciduous oaks are to be met with. The coppices are cut at 10 to 12 years for tan bark and for charcoal.

Chestnuts are grown as coppice with a rotation of from 25 to 30 years. They produce wood for carpenter's work and highly esteemed staves; the chestnut shoots which are cut when the coppices are cleared furnish hoops for casks and strips for basket work, while the nuts are used as food for the people and for fattening pigs. Nevertheless chestnuts tend to disappear from Portugal, as in the rest of the Mediterranean countries.

During the last five or six years the Bureau of Forest Research has undertaken the study of the different methods of controlling the disease which destroys chestnut trees without apparent cause, and which it was believed at first would not have attacked woods situated at high altitudes.

Exotic plants. — A mild climate favoured by the neighbourhood of the Atlantic, favours the acclimatisation of trees of the two hemispheres.

In our parks under cover of the trees of the North of Europe and of America, under pines and Mexican araucarias, by the side of which the exuberant vegetation of eucalypti and *Acacia melanoxylon* may be admired, the ferns of the tropics and the palms of Africa are met with.

The Forest Department has been able to draw largely from abroad the plants required for reforesting the highest summits of its mountain ranges.

Silver fir, *Abies Pinsapo*, larch, Scotch pine, Corsican pine and fir will form the future woods at heights above 3300 feet which is the upper limit of the maritime pine, which however can be used as a forest tree up to 4000 ft. The pedunculate oak, the Pyrenean oak and the chestnut do not usually pass this limit in good conditions of growth.

Besides these forest trees the following might be mentioned as reproducing naturally in Portugal: *Sequoia sempervirens*, Douglas fir, *Cupressus glauca*, cedar of Lebanon, deodar, Atlas cedar, and the tan acacias (*A. mellissima*, *A. pycnantha*, *A. decurrens*).

Acclimatization of exotic plants. — The acclimatization of many exotic plants presents no difficulty in Portugal, as may be seen from the avenues in Lisbon in which *Cercis japonica*, *Sophora japonica*, Ailanthus, lime, mulberry and Indian lilac thrive. The public parks and gardens, as well as the national arboreta of Bussaco and Pena, are rich in specimens of trees of all climates.

Work of reforestation to be carried out. — As has already been stated the area occupied by forests in Portugal corresponds to 10 per cent. of the total area of the country, taking into account the 1,715,914 acres covered by evergreen oaks.

But if it is remembered that the stands of evergreen and cork oak are not utilized for their production of wood, that the woods composed of old kinds of trees but rarely clothe the high plateaus and the tops of the mountains, an easy explanation will be found of the bareness of the latter and of the great importation of building timber.

The result is that without any doubt the area to be reforested in the State, including the 89,000 acres of shifting sand-dunes, may be reckoned at about two and half million acres, unless private initiative steps with its assistance. The accomplishment of this task, however, owing to the limited resources of the budget and to the hostility of the inhabitants of the mountains, is still far off.

As for the final and economic success of the undertaking, the work that has already been done does not leave any room for doubt.

The thousands of acres of shifting dunes that have been fixed, the fine stands of pines and of native oak which clothe the slopes of the reforested mountains, and those of exotic trees which already crown the highest summits, are a convincing proof.

Importation and exportation of forest produce. — A comparison between the returns for 1870 and 1910 shows clearly the progress achieved by forestry in Portugal during this period.

Importation	1870 £	1910 £
Heads, staves and hoops	76 524	168 389
Building and carpenters' timber	57 863	185 953
Cork	353	1 106
Various products	—	5 578
	134 740	361 026
Exportation	1870 £	1910 £
Building timber	32 357	206 682
Cork	143 901	992 319
Various products	12 291	34 000
	188 549	1 233 001

If the table of imports shows the progress of our forestry in 40 years, shows also from a forestal point of view that we are short of oak wood, well as of those woods required for carpenter's work and for the building of expensive houses.

On the other hand the table of exportations shows the development entirely attained by the cultivation of maritime pine, which is exported principally to England, and of cork oak, which makes up, by itself, one of the chief branches of our forest wealth.

From the above, the conclusion to be drawn is that reafforestation has made considerable progress in Portugal since 1870, thanks to the increased use of forest produce and to the general economic development of the country.

But if at present a good many waste lands are yearly put under forest culture, it is no less true that an extensive field still remains open to the activity of the foresters of the future.

Farm Management in the United States at the Present Time: the Actual Scope of its Work, and Recent Development therein

by

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As developed in the agricultural colleges and the national department of agriculture in the United States, farm management is that branch of agricultural science which deals with the business problems connected with farming. It is, in reality, a branch of applied economics. It may be logically divided into the following subdivisions:

1. A comparison of farming with other businesses as a means of earning a livelihood, including the advantages and disadvantages of the farm as a place of living compared with the city.
2. Preparation and training required for success in farming.
3. The method of securing a footing on the land.
4. The selection of the region in which to engage in the business of farming. This phase of the subject deals with the relation of geography to agriculture, and includes a review of soil, climatic, economic, and ethnological conditions in the various farming regions.
5. Principles involved in choosing the individual farm within the region selected.
6. The selection of the enterprises (crops, live stock, etc.) which are to constitute the basis of the farm business. This involves a study of the geographic and economic relations of all the different agricultural enterprises.

7. Farm organization. This branch of the subject deals with principles involved in fitting together suitable enterprises in such a way to give the most desirable distribution of labor throughout the season secure minimum expense in equipment and management, to secure maximum use of equipment and to provide employment for the capital available.

8. The character, quality, and cost of equipment required for proper conduct of the organized farm.

9. The capital required and its distribution between the factors production on the farm. This branch of the subject also deals with cost of production on the farm and the profits to be obtained from various farm enterprises.

10. Farm operation. The subjects which are dealt with in this branch of farm management are systems of operation, such as operation by the proprietor and his family, operation by hired labor, management operation by tenants, either cash or share. Each of these systems of operation is dealt with from the standpoint of its advantages and disadvantages as a means of conducting a business. Another phase of farm operation which is an important subject in farm management is the character of lease contract between landlord and tenant when the farm is operated as a tenant system. The principal phase of this subject, from the standpoint of farm management, is the division of the profits of the farm between labor and capital. The study of farm operation also includes the subject of farm records and accounts; the management of farm labour; the care and keep of equipment; the principles of marketing, etc.

Teaching Farm Management — Of the forty-eight State agricultural colleges in the United States, thirty-eight are now teaching the subject farm management, and one other state, in reply to a circular letter, that the teaching of this subject will begin next year. Thirty-six of these institutions report a total of 2575 pupils in their farm management classes. One other state states that the subject is taught to all seniors, and another states that it is taught to all students in the institution.

When it is considered that the teaching of farm management as a separate branch of agricultural science is comparatively new in this country there being only two institutions in which classes were held in this subject six years ago, it is seen that farm management is rapidly making its way into the agricultural schools of the country. We have had no satisfactory English textbooks heretofore. One good textbook has just recently become available, and another will probably be available at the beginning of the next school year. With these aids the subject will doubtless be introduced into all the agricultural schools of the country in the near future.

Farm Management Investigations. The United States Department of Agriculture is mainly an investigating institution. There is also in each of the forty-eight States of this country a State agricultural experiment station supported partly by funds from the national government and partly by State appropriations. The first of these institutions to begin studies

management investigations was the agricultural experiment station in Minnesota. These investigations began about a dozen years ago. Shortly thereafter the Office of Farm Management was organized in the Bureau of Plant Industry of the United States Department of Agriculture. Extensive investigations on the subjects outlined in the first section of this paper began in this new office. Since its organization investigation of farm management subjects has become quite general at the State experiment stations.

Following is a list of the more important subjects of investigation reported by the various State experiment stations: supervision of farms; records of labor and financial transactions on farms; farm management surveys (see below); cost of operation; cost of producing corn and wheat; investigations of capital and equipment on the farms of students; the economics of dairy farming; farm home management; the economics of stock management; economic surveys of a farm; price paid farmers for produce and paid by consumers in various States in a State; influence of absentee landlord upon crop rotations, methods of management, and types of farming; management of surplus farm help; inter-tenancy; use of farm teams to best advantage; systems of accounting; distribution of labor on various crops; comparative cost of production under humid conditions and under dry farming conditions; most profitable production systems adapted to different sections; relation of type of farming to profit; economic study of the retail milk business; cost of producing maple sugar and maple syrup; marketing of farm products; marketing of land; land tenure; history of agricultural production; proper amount of farming on a given area of land.

The nature of most of the above investigations is sufficiently indicated in their titles. The farm management surveys, which are becoming of the most important phases of farm management investigations in this country, need some elucidation. In this work groups of not less than a hundred farms are studied in sufficient detail to determine the labor income of the farmer. In these studies the gross income and the total expense of each farm are determined. The labor income is then calculated by deducting from the net income of the farm interest on the capital invested and the value of unpaid labor performed by the members of the farmer's family. What is left is considered to be the labor income of the farmer himself.

One result of these studies has been to indicate that on an average the income of the farmer is sufficient to maintain the farm and its equipment, interest on the investment, and ordinary wages to the farmer. It is seen that farming compares favorably with other industries in which there is free competition and in which production is limited only by demand. It has been found that generally speaking the size of the farm is a very important element in profit. With many exceptions it has been found to be a general rule that the larger the farm the larger the labor income. In the more fertile sections of the country where the average farm is large and where the farmer uses large teams and large machinery, the labor income rises

considerably above the average. On the other hand, in those sections where the farms are small and where the farmer uses small teams and implements the average labor income is below the average for the country. It would be interesting to know whether these conditions hold in other countries than the United States.

Work of the Observatory of Phytopathology in Turin

by

Prof. PIERO VOGLINO,

Director of the Observatory.

With the object of enabling Piedmontese farmers to know the diseases that attack cultivated plants and the means of controlling them, the President of the Agricultural Association of Turin took the initiative of an Association for the institution of a district phytopathological observatory. The Ministry of Agriculture, the Savings Bank, the Municipality, the Charitable Foundation of St. Paul, and afterwards the Chamber of Commerce of Turin, answered the invitation. At a meeting of the representatives of the above bodies a Statute and Regulations were discussed and approved. In December 1908 the Council of Administration of the new Institution met under the presidency of Count Rebaudengo. The Observatory began to work regularly on January 1, 1909 under the name of "Osservatorio Consorziale di Fitopatologia" and with the aim of exercising a strict surveillance on the plants cultivated in the district, with the objects of: 1. informing the public every month of the appearance of harmful parasites and other dangers to plants, at the same time forwarding a list of them to the Ministry; 2. studying the causes of the diseases and pointing out in due time the best means of control; 3. spreading among farmers, by means of meetings, discussions and practical lessons, to be held in several localities, practical notions on plant diseases and their control; 4. instituting, with the farmers, experiment fields for the control of the most widely-spread plant diseases; 5. watching over, in respect to diseases and requested by the Municipality, the public gardens and avenues of the city of Turin and applying, where advisable, the proper means of control; 6. examining suspicious mushrooms if requested to do so by the Bureau of Hygiene; 7. giving verbal or written consultations to farmers of the district and paying visits to the various localities; 8. attending to the institution of a special Museum of vegetable Pathology; 9. presenting in the first quarter of each year a comprehensive report on all the work done at the progress of the observatory during the preceding calendar year.

The institution was hailed with enthusiasm, but before the full utilization of the Observatory could be established it was necessary to allow a certain period of time to elapse:

The constant requests for visits, the abundance of material sent or brought for examination, the numerous consultations, and the frequent visits to the Museum, show the lively interest that farmers take in the institution and that they recognise the advantages they can reap from it. The Observatory has marked in Italy a considerable progress in the control against parasites. The real utility lies in the touch between the farmers and the pathologist, so that when the natural mistrust has worn off the tiller of the soil gains confidence in the man who gives him exact notions on the uses of the diseases which attack plants, and on the means of controlling them. The farmer knows that there is an institution directly responsible for the prevention of the spreading of plant diseases.

In every commune of the province of Turin, the Observatory has two, or six local observers, who are selected from among the most willing farmers, under the guidance of a head local observer. They can easily point out the various diseases and communicate to their neighbours the practical advice sent out by the Observatory. In order to facilitate sending away specimens, in every commune there is a depot of special tin boxes.

Thus the local observers, who are upwards of 500, report carefully on the slightest signs of disease in plants, and forward abundant material; thanks to their assistance the Observatory was able to discover the causes of much mischief in the province of Turin and in several other parts of Piedmont. In the Bulletins, which are published monthly, and in which lists are drawn up of the various plant troubles reported together with the practical advice tendered, account is given of the following work: 1511 examinations of plants, 816 visits, 88 meetings, and a correspondence numbering 105 letters, in 1910; in 1911 the examinations were 1537, the meetings 850 farms were visited and 3083 letters written; in 1912: 1752 examinations, 973 visits, 85 meetings and 3220 letters.

There is a constant increase in the number of visitors to the Museum, in which a great number of specimens of the diseased plants that have already been investigated, and of the parasites which affect them are collected, and is encouraging to see that the practical farmer examines with attention the various specimens which show the development of the parasitic plants and how he understands the necessity of certain methods of control.

The development of some fungi and insects hitherto imperfectly known has been followed not only by means of the specimens collected at different times and in several places, but also by microscopic examinations and by special laboratory cultures.

The Observatory, considering that its chief objects in view are investigations on the diseases of plants and their remedies and the practical application of the same, has conducted numerous experiments with various substances against the most injurious parasites, endeavouring always to order the treatment as simple as possible, considering the scarcity and high price of labour. Of the many specifics sent to the Observatory for recommendation, only those of which the composition was declared were taken

into consideration, and handed over to expert farmers to be tested under the surveillance of the Observatory.

In order to popularize the use of remedies and cures the effect of which is certain against some widely spread diseases, every year communal competitions are held and special prizes are awarded by the Observatory, the Ministry of Agriculture, the Royal Academy of Agriculture of Turin, the Turin Agricultural Association (Comizio) and other bodies.

A brief sketch is here given of the principal scientific results obtained by the study of several fungus forms. In 1904 the following were specially observed: The presence of *Taphrina bullata* Bel. with organs of fructification on pears; the prolonged presence of large conidia of *Phyllactinia cornalea* and the formation of epiplectic hyphae of the perithecia; the development as a true parasite of *Phyllosticta maculiformis*, equal and even superior to that of the *Cylindrosporium castanicolum* form; a very remarkable development in length in the branches of hornbeam affected by *Melampus Carpinis* (Nees) Fuck.; the greater secretion and consequent formation of a greater number of cystids in the leaves of *Celtis australis* affected by *Gyrocampa Celtidis* (Br.) M. et C., and abnormal development in the cellular tissue of the branches; three new species of fungi. The observations of 1905 embraced: The distinct parasitism of *Stereum frustulosum* and *Daedalea quercina* on oak; the passage of *Phyllosticta prunicola* in hybernating form, on to the branches of plums; the very disastrous infection of *Gloeosporium Platani* = *Gl. nervisequum* caused by excessive humidity the identity of *Pyricularia Oryzae*, of *P. parasitans* and of *Dactylaria parasitans* with *D. grisea*; the identity of *Cercospora hypophylla* with *C. Rosa alpinæ*; four species and two new forms.

In 1906 the following were observed: marked characters of *Peronospora* shown by *P. cubensis* with extraordinary development of the micellium, and presence of haustoria in the epidermal cells of the leaves of cucumbers, as well as oospores in the leaf-tissue; parasitism of some species of *Pyloporus* and of *Collybia velutipes*; resemblance between *Phyllosticta Bolleana* and *P. Evonymi*; *Sphaerella hedericola*, ascophorous stage *Septoria Hederæ*; *S. Campanulæ* = *S. Trachelii*; presence in Italy of *Dothichiza populea* Sacc. and its parasitism on *Populus canadensis*; reference of *Vermicularia trichella* and *V. circinans* to the genus *Colletotrichum* *Marsonia Potentillæ* = *Gloeosporium Fragariae*; two new forms: *Phyllosticta Ribis-rubri* and *Septoria Soldanellæ* var. *pyrolæfolia*.

Notable are the results obtained in 1907, namely observations on the marked parasitism of *Pythium* on the roots of *Centaurea*, the formation of conidiophores with conidia about the collar of the infected plant and numerous oospores in the dead tissues; the parasitism of *Phragmonectria laetissima*; reference to *Ascochyta hortorum* of *Phyllosticta hortorum* *Phoma Solani*, *Ascochyta Lycopersici*, *A. socia*, *A. solanicola*, *A. Atropis*, *A. Alkekengi*, *A. pedemontana*; *Septoria Leucanthemi* parasite of cultivated species of *Leucanthemum* and *Pyrethrum*, with spores 100 to 130 μ length and 4 to 5 μ wide, with 12 to 14 transverse septa; seven new forms *Phyllosticta Balsaminæ* parasite of *Balsamina*, *Pyrenochaeta Centaureæ*.

Uromyces candidissima, *Septoria foetida* on *Datura Metel*, *S. longispora* on *Ulex Drummondii*, *S. Limnanthemii* on *Limnanthemum nymphoides*, *S. terholdii* on *Centaurea candidissima*, *Colletotrichum ampelinum* f. *ramicola* on vine canes.

From the study of fungus forms in 1908 it was observed that: *Oidium rinosum* = *Sphaerotheca pannosa*; *Gloeosporium Trifolii* = *G. caulivorum* = *pseudopeziza Trifolii*; *Ascochyta contubernalis*, *A. pucciniophila* and *Phyllosticta pucciniophila* = *Darlucia Filum*; presence of *Cytospora Celtidis*, *Colletotrichum Grossulariae*, *Alternaria Violae* and *Oidium quercinum* in Italy; no new forms of *Botrytis*, viz f. *Ocimi* and f. *Punicae*; four new species: *homopsis populina*, *Ascochyta Phlogis*, *A. Eriobotryae* and *Leptothyrium acorniae*.

In 1909, together with the parasites already noticed in the preceding years, some new forms were observed, namely: *Peronospora Viciae* widely read in the mountains on the leaves of peas and of *Orobus vernus*; *Sclerotinia Libertiana* on chervil; *Oidium leucoconium* on green and dry peach branches and on almond fruits, and the perithecial form, *Sphaerotheca annosa*, on rose and apple trees. Among new forms: *Sclerotinia Ocymi* f. *basil*; the ascophorous form (*Cenangium populneum*) of *Dothichiza poldea*; the probable reference of oak mildew with *Oidium ventricosum*; *Botrytis parasitica* var. *Colchici*, *B. cinerea* f. *Dianthi*.

In 1910 the following observations were the most important: *Bremia actuae* Reg. on *Dimorphotheca*; *Sclerotinia Libertiana* Fuck. on *Scorzonera*, *Helianthus* (sunflower, Jerusalem artichoke), *Daucus Carota*, *Brassica abbage* and cauliflower, *Solanum*; the perithecial form of *Sphaerotheca annosa* Lévl. on peach twigs; *Rosellinia radiciperda* M. on apple trunks; *Gibberella moricola* (De Not.) Sacc. injurious to young mulberries; *Gloeosporium fructigenum* Berk. on pears; *Gl. lagenarium* (Pass) Sacc. on cucumbers; *Scolecotrichum melophthorum* Prill et Del., very injurious to nupkins; and two new forms: *Botrytis parasitica* f. *Armeriae* and *mulariae Doronici* Vogl.

Important observations made in 1911: *Lophodermium Pinastri* (Sch.) Ev. and *L. laricinum* Duby, on Scots pine and on larch; *Nectria ditissima* in new form on apple trees; *Gibberella Saubinetii* (Mont.) Sacc. on wheat; *Coniothyrium Fuchelii* Sacc. on pear trees; *Ascochyta Cannabis* (Speg.) Vogl. = *Uromyces Cannabis* Speg., on hemp; *A. Begoniae* (Fl. Tassi) Vogl. = *Uromyces Begoniae* Fl. Tas., on begonias; *A. piri* Peglion on pear trees; *Uromyces piri* Sacc. on white beam; *Colletotrichum Lindemuthianum* (Sacc. Magn.) Br. et Cav. and *Scolecotrichum melophthorum* Prill et Del. on ung haricot plants; *Cladosporium Heliotropii* Eriks. on heliotrope; *Uromyces Solani* Ell. et Mart. on tomatoes; and three new species: *Uromyces parastictum* Vogl. on the leaves of *Crataegus glabra*, *Coniothyrium opuntiae* Vogl. on branches of the prickly pear, *Ascochyta laricina* Vogl. on the shoots of larch. In 1912 the following were observed: a bacterium of Oleanders; the disastrous parasitism of *Phytophthora Cactorum* on the stems of *Capsicum annuum*; *Pythium de Baryanum* parasitical on roots of beans; *Sphaerella Vulnerariae* on the leaves of *Anthyllis Vulne-*

varia; *Rhinoctoina violacea* on chards or sea-kale beets and on parsley; the extensive and disastrous infections of *Ophiobolus graminis* Sacc. on wheat; *Cladosporium fulvum* var. *violaceum* on tomato leaves; *Ascochyta hortorum* injurious to the egg-plant and to capsicum, and some new species.

Among animal parasites the development of several species of *Hypomenella* and of *Carpocapsa* was followed and the means of control were taught.

In almost all the mountain valleys the leaves of larches were injured by *Coleophora laricella* and in the plains the plane trees by *Lithocolletis platani*. In market gardens cabbage butterflies (*Pieris*) and cabbage moths (*Mamestra*) caused much mischief, *Polya dysodea* damaged lettuces and *Acrolepia assectella* leeks.

On fruit trees some very injurious Coleoptera were observed, such as *Othiorhynchus*, *Anthonomus* and *Magdalis*; on the Canada and Carolin poplars, especially in young trees and in nurseries, the leaves in spring were often found rolled up or damaged by *Rhynchites* and by *Lina populi*. The leaves of elm trees are often infested by *Adimonia xanthomeleana*. On cereals *Zabrus gibbus* and *Agriotes lineatus* were studied; in many gardens *Lema lili* devoured the leaves of the lily. As for Hymenoptera, the damage done to apple, plum, pear and currant by *Hoplocampa fulvicornis*, *Nematus ribis*, *Calyroa limacina* and *Lyda pyri* was observed. *Croesus septentrionalis* was found rather widespread on Canadian poplar. Several Diptera injure vegetables: *Phytomyza* on carrots and colza, *Aricia* on beets and on spinach, *Acidia heraclei* on celery. Among Hemiptera many species of *Aphis* and *Lachnus* have been observed and combated on several vegetables, on roses, *Robinia* and *Sophora*. Very widely spread and injurious are *Hyalopterus pruni* on peach and *Schizoneura lanigera* on apple.

Chionaspis evonymi has now invaded almost all spindle trees; *Mytilasp pomorum* tends to spread on the stems and branches of Canadian poplar notwithstanding the fact that some parasitic acari, *Emisarcoptes*, *Encyrtus*, *Eremus minimis*, and several Hymenoptera, *Habrolepis zetterstedti*, *Aphelinus mytilaspidis* and *Phycus* sp. devour its eggs.

Diaspis pentagona was also found to be very widely spread, occurring on a great variety of trees and herbaceous plants.

Among acari, *Tetranychus* on vine, horse chestnut, haricots, etc. was found in many places causing drying up of the leaves. *Phytolius* on fruit trees and *Pentaleus major* in market gardens, damaging beet peas, pumpkins, etc., were also discovered.

The scientific observation of the life history of animal and vegetable parasites led to the publication of the "Enemies of the Canadian Poplar" and the yearly publication (begun in 1904) "The plant-parasites observed in the province of Turin and neighbouring districts", besides other notes and memoirs published by the staff of the Observatory.

The problems connected with the diseases of plants, and especially the control, are very complex.

It is not always possible to make use of the best remedies, owing sometimes to the difficulty of applying them, at others to their price being

gher than that of the produce of certain crops. The Observatory is investigating some means of natural defence, such as growing resistant varieties, the introduction of parasites which live at the expense of the injurious ones.

Some good result has already been obtained, as is proved by the confidence shown by the farmers in the Observatory; which will continue on its course supported by the knowledge that it is contributing to the welfare of the agriculture of Italy.

Work of the Phytopathological Section of the Central Agricultural Experiment Station in Stockholm in 1912

by

Prof. JAKOB ERIKSSON,

Chief of the Section.

I. *Work on potato diseases.*— In contrast to 1911, when potato disease (*Phytophthora infestans*) hardly showed itself in Sweden, the season of 1912 seems to have been particularly favourable to the free development of this fungus. In this year the disease began to appear earlier than usual. The first reported case was on the 9th of July from a place in Östergötland. A week earlier, however, it had been noticed in a potato plot in a garden in Scania, the disease was found near Malmö on the 17th of the same month. As the disease had occurred at such an unusually early date, the attention of growers was drawn to the subject by a communication to the papers, stating the advisability of immediate spraying with Bordeaux mixture wherever possible. A leaflet on the subject was also got out at once, entitled "Bespritzning med Bordeauxlösning" (1) (Leaflet No. 35, July 1912). In this, instructions were given for preparing and applying the mixture. It was only during August that it seemed that the apprehensions of a year of serious disease had been exaggerated: in many places, such as about Stockholm, the potato haulm remained healthy well on into September. In the same, the apprehensions were in the end justified: when the crops were lifted, reports came in one after another from nearly all over the territory, including Scania, to the effect that the potato crops were much reduced by the disease.

Spraying had been carried out in various parts of the country: in all cases the results were remarkably good, although the sprayings were made very late (the first not till after the appearance of the disease).

(1) "Spraying with Bordeaux mixture".

(Ed.).

In August a species of fungus, *Hypochnus Solani* Prill. et Del., hardly known before as harmful, appeared in several places, doing most damage at Tranås (Småland). The disease began on the lower parts of the stalks and appeared as a very dense whitish grey coating, reaching to 1½ or 2 inches above the ground, and stopping at the point of insertion of the lowest leaf. This whitish coating consisted of a mycelium of branched and septate hyphae. Below the soil this coating became darker, of a brownish colour, and extended onto the stolons and roots, where it became still darker and more compact, here and there producing sclerotia. These sclerotia, which were black, were found to belong to the species long known as *Rhizoctonia Solani* Kühn. During the year, an article on this disease was published under the title of "Filtsjuka å Potatis (*Hypochnus Solani* Prill. et Del.)" (1).

But the year 1912 will be recalled as a particularly serious one for the future of potato-growing in Sweden in that it saw the discovery in the country of the new and destructive disease known as "black scab" (*Chrysophyctis endoblotica* or *Synchytrium Solani*), which has developed to an alarming extent in Great Britain during the last ten years. It is also firmly established in Germany, where it seems inclined to spread.

This disease was found on the 2nd of October, first in the garden of a house in the Stockholm archipelago (on the island Ljusterö) and soon after on a farm in Södermanland (near the railway station of Järna); it also occurred on some land belonging to the Agricultural Labourers' Benevolent Society, and lastly in a garden and neighbouring field about half a mile away from this land. From the investigation made, it appears that the centre of infection was the farm at Järna. The disease had established itself in 1910 or 1911, having been introduced in empty sacks sent by a salesman in Stockholm, who bought potatoes from this farm as well as from Germany, to sell in Stockholm. The disease was introduced into the garden in the Stockholm archipelago by seed potatoes which had come from the farm mentioned. The infected land amounted to about 1½ acres, while the potatoes diseased comprised some 300 tons.

As soon as the disease was discovered, the authorities were informed; and a grant was asked for, first for the destruction of the diseased potatoes and for compensation to the growers under this head, and further for the disinfection of the soil in which the diseased crops had grown. For these two purposes the Swedish Government made an allocation of 4 000 crowns (about £220). The diseased crops were destroyed as follows: the potatoes were thrown into a large trench opened for the purpose and petroleum was thrown over them; the trench was then filled in. The diseased land was treated by watering with 1 per cent. formalin solution, at the rate of about 2 gallons per square yard.

To prevent the disease being introduced into other places, a proposal was brought forward to prohibit all importation of potatoes; but the Government has yet to come to a decision on this matter.

(1) "Felt-disease" of potatoes.

(Ed.).

2. *Work on beet diseases.* — Researches carried on for several years on beet diseases in Sweden led to the publication of an article on the subject in 1912. This is entitled "Svampsjukdomar å svenska betodlingar" (1); it deals with the following diseases: *Uromyces Betae* (Pers) Kühn, *Bacillus tabificans* Del., *Rhizoctonia violacea* Tul., *Phoma Betae* Frank, *Cercospora beticola* Sacc., *Sporidesmium putrefaciens* Fuckel, and others.

A short study on *Rhizoctonia violacea* on beets, as well as on carrots, turnips and kohlrabi, was published under the title "Études sur la maladie produite par le *Rhizoctone violacé*" (2) (*Revue générale de Botanique*, Vol. 15, p. 14). It has been found that the reddish fur which develops on the roots of these plants, at any rate that occurring on carrots, constitutes a sterile stage of a species of *Hypochnus*, which develops more fully on various other plants, e.g. chickweed (*Stellaria media*), *Erysimum cheiranthoides*, and sowthistle (*Sonchus arvensis*); all of these occur as arable weeds in the root-growing districts. The spore-bearing stage is named *Hypochnus violaceus* (Tul.) Eriks. This fungus therefore shows a sort of heteroecism.

3. *Work on the withering of flowers of fruit-trees.* — An account of the researches on this disease, also carried on for several years, was published in 1912 under the title "Om blom- och grentorka (*Monilia-torka*) å våra fruktträd" (3), as well as in German under the title "Zur Kenntnis der durch *Monilia* Pilze hervorgerufenen Blüten und Zweigdürre unserer Obstbäume" (*Mycologische Centralblatt*, Vol. 2, p. 65). In this work, a point mentioned as of special importance for growers is to treat for the stage of development corresponding with the very first period of the fungus; in this stage it forms little grey pustules on the fruit-spurs and twigs, which may remain after the previous year's attack; the treatment should be carried out before the leaves open. These pustules contain the first generation of spores of the new year, and it is from them that the fruit and wood buds get infected soon after. It is of primary importance to get rid of these first centres of infection; this can be done by an early cutting-out of all dead wood, or by spraying the whole tree with 2 per cent. Bordeaux before flowering.

4. *Observations on diseases of vegetables.* — During 1912, a number of diseases occurred on horticultural plants of different sorts and were much discussed: many of them were new for Sweden. They were fungus diseases of cucumber, French beans, tomato, asparagus, rose, hyacinth, etc.

Among the researches into these diseases, only those on cucumbers and melons are so far ready for publication. A summary of these, under the title "Svampsjukdomar å svenska gurkväxtodlingar" (4) is in the press. The following fungi causing diseases are described: *Cladosporium cucumerinum* Ell. et Arth., *Cercospora Melonis* Cke., and *Colletotrichum lagenarium* (Pass.) Ell. et Halst.

(1) Fungus diseases of Swedish beet crops. (Ed.).

(2) Studies on the disease produced by *Rhizoctonia violacea*. See No. 426, B. April 1913.

(3) On the withering of blooms and twigs (*Monilia*-withering) in our fruit trees. (Ed.).

(4) The fungus diseases of Swedish cucumber crops. (Ed.).

As the results of many of these investigations point to the seed as the source of the disease, a leaflet was published entitled "Tillvaratag från friska kulturer!" (1) (Leaflet No. 36, Aug. 1912).

5. *Examination of samples of diseased plants received at the Institute.*— In 1912, 515 samples were sent in; all were examined and reported on.

6. *Various work.*— Besides those mentioned above, the following publications appeared during 1912: "Fungoid Diseases of Agricultural Plants" (London: Baillière, Tindall and Cox, pp. XV + 208.)— "Ueber *Exosporium Ulmi* n. sp. als Erreger von Zweigbrand an jungen Ulmenpflanzen" (*Mycol. Centralblatt*, Vol. I, p. 35). — "Rostige Getreidekörner, und die Ueberwinterung der Pilzspezies" (*Centralbl. f. Bakt.*, Abt. 2, Vol. 32, p. 453). — "Krusbärsmjöldaggen i Sverige juni 1912" (2) (*Svenska Dagbladet*, July 8, 1912), and "Krusbärsmjöldaggen under juli månad" (3) (*Svenska Dagbladet*, Aug. 25, 1912).

At the International Congress of Comparative Pathology held in Paris from the 17th to the 23rd of October, 1912 a report was printed entitled "Que faire pour éviter les maladies propagées par les graines et les arbres des pépiniéristes?" (4).

(1) Save seed from healthy crops.

(Ed.).

(2) American gooseberry mildew in Sweden in June, 1912.

(Ed.).

(3) American gooseberry mildew in July.

(Ed.).

(4) What can be done to avoid the spreading of diseases by seed and trees from nurseries?

(Ed.).

SECOND PART. ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

6 - **Agriculture in Modern Greece.** — MARESC, O. R., in *Österreichische Agrar-Zeitung*, Year 4, No. 15, pp. 174-178. Vienna, April 12, 1913.

The total area of Greece is 15 978 750 acres; this consists of:

Cultivated land	3 532 000 acres, or 22.10 per cent.
Meadow and pasture	4 990 000 " " 31.22 "
Forest	2 025 500 " " 12.67 "
Waste land	5 431 250 " " 34.01 "

The high percentage of waste land is explained by the circumstance that two-thirds of the area is either mountainous, and therefore only to limited extent available for agriculture, or else too poor to be remunerative as arable land. Therefore other forms of cultivation are gradually gaining ground, such as olive groves, vineyards, vegetable gardens, etc., since the dry climate is suitable for deep-rooted plants (especially vines and tobacco), and because the extreme subdivision of the land, the deficiency of capital and credit, together with the low rate of wages, lead to the cultivation of those plants which, though they require more labour, yet fetch a higher market price.

The average size of the mountain holdings is from 1 $\frac{1}{4}$ to 2 $\frac{1}{2}$ acres, while in the plain the farms run from 12 to 25 acres, and in Thessaly their extent is 250 acres or more. On the mountains wheat is usually taken after two or three years' fallow, while on the plains a simple three-crop rotation is practised.

Agricultural machines are of rare occurrence and it is only of late years that the old Hesiod plough has been replaced by better implements of central European manufacture.

Manuring leaves much to be desired; artificial fertilizers are very seldom

employed. The regulation of irrigation is also much neglected. Grain is threshed by animals treading it out.

Greece does not produce two-thirds of the 10 million bushels of wheat which it requires to supply its needs; though the million and a half bushels of barley grown supply the demand. The production of home-grown potatoes is also inadequate. The annual maize crop is about $2\frac{1}{4}$ million bushels and the rice harvest is sufficient to supply the country. Potatoes are exported to a small extent. About 18 500 acres are under tobacco, producing annually about 190 000 lbs. of tobacco of excellent quality. Cotton-growing is increasing in importance.

In good seasons the vineyards produce an average of 88 million gallons of wine. The must is trodden out in a very primitive manner in rectangular walled-in pits. Next to cereals, dried currants are the most important product. About 116 000 acres are devoted to the vines producing them, and the value of the annual yield varies from £1 250 000 to £1 660 000. The net return from currant cultivation is often 8 per cent. of the capital expended.

Olives are grown throughout Greece, but little care is given to the trees. The cultivation of Southern fruit (oranges, lemons, figs, etc.) is much neglected. Lately, vegetable growing has made considerable progress and is a fairly good source of revenue, both to the islands and to the south-eastern portion of the mainland.

Cattle breeding does not form an independent branch of agriculture in Greece, for cattle are mostly kept for the purpose of turning the arable land to account. Horse breeding is at a very low ebb as there is a deficiency in capital and in good grazing ground. Amongst the native breeds of horses are to be distinguished the Skyros and Pindos; both are small, thrifty and sturdy. On account of the scanty supply of fodder, many more donkeys and mules than horses are bred.

Cattle are chiefly bred for draught, the production of milk and meat being quite a secondary consideration. Among the native breeds are: 1) the so-called Greek breed, distinguished by its light frame and the fine flavour of its meat; 2) the Macedonian, which, except for being somewhat smaller, possesses all the characteristics of the Steppe cattle; 3) the polled Syrian breed.

Greek sheep are noted for thrift and hardiness; in order that they do not lose these characters, they are not interbred with milk and mutton producing animals. The output of wool is negligible and the quality inferior. There are two indigenous breeds: the Greek or so-called peasant sheep, and the island breed. The former have thick long, pendant and usually dark coloured wool, while the latter breed produces finer wool and is more exacting in its requirements.

Goat breeding is much developed; there are over 3 million head of these animals, or 80 per square mile.

Bee-keeping is a very ancient Grecian industry, and is especially common in the Cyclades. The annual production amounts to about 1000 tons of honey and 90 tons of wax.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES 1011

7 - The Extension of Plantations in the German Tropical Colonies. — SCHULZE IM HOPE, A. in *Deutsche Kolonial. — Zeitung*, Year 30, No. 21, pp. 346-347. Berlin, May 23, 1913.

The writer estimates the capital at present invested in plantations in the German colonies at about £. 5 000 000. The areas brought under cultivation in the years 1907, 1908 and 1911 were, for the various crops, as follows :

Rubber plants.

	1907	1911
	acres	acres
East Africa	12 479	81 450
Kamerun	5 142	17 745
New Guinea	4 376	5 812
Samoa	1 510	2 130
Togo	237	405
	<hr/>	<hr/>
	23 744	107 542

Coconuts.

	1908	1911
	—	—
New Guinea	48 367	62 430
East Africa	15 538	16 818
Samoa	9 425	11 587
Togo	1 433	1 433
	<hr/>	<hr/>
	74 763	92 268

Sisal Hemp.

	1907	1911
	—	—
East Africa	25 588	52 721
Togo	74	324
New Guinea	86	220
	<hr/>	<hr/>
	25 748	53 265

Cotton.

	1908	1911
	—	—
East Africa	15 182	35 356

Cacao.

	1907	1911
	—	—
Kamerun	18 961	26 327
Samoa	3 754	5 392
New Guinea	555	1 021
Togo	230	371
East Africa	247	247
	<hr/>	<hr/>
	23 747	33 358

Office.

East Africa 7 164 7 166

The following table shows the total area under cultivation, the number of white employees and the number of coloured hands in each colony.

1911	Area under cultivation	White employees	Coloured hands
East Africa	202 212	557	60 835
New Guinea	69 670	182	13 742
Kamerun	49 420	147	13 272
Samoa	20 641	78	2 053
Togo	2 647	8	536
Total in 1911	344 590	972	90 438
" " 1910	311 637	811	81 340
" " 1909	243 763	731	66 968
" " 1908	216 327	591	52 085

On account of the present shortage of labour in Kamerun and East Africa it need not yet be concluded that plantations have reached the limit of extension. The shortage of labour is rather due to the incomplete development of the railways, which causes about a half of the available labour to be engaged in carrying the produce to or from the interior and to coast or to the railway stations; this labour is thus withdrawn from productive work. Only through further extensions of the railways will the shortage of labour be avoided and new plantations rendered economically possible.

768 - The Promotion of Agricultural Instruction and Experiment in Switzerland by the Union, in 1912. — *Bericht des eidgenössischen Handels-, Industrie- und Landwirtschafts-Departments über seine Geschäftsführung im Jahre 1912*: III. Abteilung, Landwirtschaft, pp. 2-10. Bern, 1913.

In 1912, 14 students of the agricultural division of the technical College at Zürich received a total grant of £170 13s from the Union. There are at present in Switzerland four Agricultural Schools which are open throughout the year (Strickhof-Zürich, 63 students in 1912; Rütli-Bern, 70 students; Ecône, Valais, 24 students; Cernier Neuenburg, 57 students), winter-schools (992 students) and one Cantonal Horticultural School (Geneva, 41 students).

The Union paid the Cantons half the educational expenses, which in 1912 amounted to £2286 3s for the whole-year schools, £5079 19s 3d for the winter schools, and £636 7s for the Geneva Horticultural School, or total of £7992 9s 3d. The Inter-cantonal Fruit, Vine and Horticultural School at Wädenswil, which has 12 students, received a grant of £383 1s from the Union.

Further, the Union defrayed half the expenses (£1698 18s 6d) incurred by 15 Cantons for agricultural lectures and courses, and for experiments on cheese-making, stall-feeding and manuring of pastures. Six Cantons

d half their expenses for vineyard experiments paid, the sum granted amounting to £957 16s 8d.

The Union supports three Agricultural Chemistry Institutions (Zürich, m, Lausanne), two Seed Control Stations (Zürich and Lausanne), and a Dairy and Bacteriological Experiment Station at Liebefeld in Bern. Last year these institutions carried out 2057 field experiments, 53 vineyard experiments and 522 pot experiments, as well as 28350 other investigations (concentrated feeds, fertilizers, soils, milk, seeds, etc.) in the laboratory. The Dairy Institute at Liebefeld has provided cheese factories with 4959 pure cultures for the preparation of rennet. The total number of experiment stations cost the Union £16934 8s, which must be set against receipts amounting to £4393 16s.

The Swiss Experiment Station for Fruit, Vines and Horticulture at Adenswil, with an income of £831 9s and expenses amounting to £4449 2s, received a contribution of £3617 13s from the Bank of the Union. The Station, in addition to experimental work, holds short courses on fruit and vine growing, which were attended by 503 students.

Three Cantons (Bern, Freiburg and Vaud) have dairy schools, with a total of 121 students. The Union defrayed half the cost of these, which was £1349 17s.

1. - **The Study of the Science of Rural Administration at the Berlin Agricultural College.** — FINK, E. Von den landwirtschaftlichen Abteilungen der Hochschulen. — *Landwirtschaftliche Umschau*, Year 5, No. 15, pp. 355-356. Magdeburg, April 11, 1913. The Berlin Agricultural College (Landwirtschaftliche Hochschule) has organized for the present summer term, a special course of instruction in the science of Administration in order to supply the necessary information on the subject to persons intending to qualify for entrance into the service of the members of Agriculture, or similar bodies, or of large agricultural corporations, associations, etc., or to become agents and managers of large estates and agricultural-technical undertakings.

The course lasts two sessions and a special examination can be taken at its conclusion, which is optional and is regarded as supplementary to examination for the agricultural diploma, or certificate of instructor in agriculture. The curriculum includes lectures on the following subjects, which are supplemented by practical work in the College.

1. The principles of national and communal administration.
2. Rural administration.
3. Civil law.
4. Finances.
5. Insurance: social and private insurance.
6. Selected chapters of agricultural policy.
7. Cooperation in its relation to agriculture; organisation and pre-conditions of agricultural cooperation in Germany.
8. The use of cooperation in agriculture; its principles, history and present forms.
9. The technique of cooperative administration, including the administration of cooperative unions.

10. The law of cooperation.

11. The principles of commerce: the general principles of commerce and their application to rural economy. The principles governing wages, credit and Stock Exchange operations.

770 - **The Teaching Method in the Provincial School of Agriculture and Cattle Breeding at Ath, Belgium.** — LONAY, ALEX. in *Annales de Gembloux*, Year 2, Part 4, pp. 198-199. Brussels, April 1, 1913.

The method of instruction adopted in the Ath Provincial School of Agriculture and Cattle Breeding is the so-called direct or "active" method by which the student learns chiefly by his own exertions: he is required to test all he hears from his teacher by reference to nature, if possible, or else by having recourse to photographs and drawings, etc.; he must accustom himself by practice to measuring, valuing and calculating, as well as to estimating the age, value and defects of animals, the condition of land and of crops, and the comprehension of leases, contracts for buying and selling, as well as the formulae used in analyses.

In order to make it possible to practise this method of instruction the plan of study is not divided, as is customary, into hours, but into days. The lecturers on farm crops and animal husbandry are required to demonstrate from the crops and animals on the land and at the homestead instead of following the usual text-book methods.

The lectures on the principal branches of agriculture (tillage, crop cultivation and the science of breeding) also give instruction in the preliminary scientific subjects (physics, organic and inorganic chemistry, mineralogy, geology, botany, zoology and bacteriology). In this manner, students, while not going into unnecessary details, acquire a sufficient knowledge of pure science to enable them to understand thoroughly the chief branches of their work. Every instructor is also required to explain the working of the machines and the use of the implements employed in the branch of agriculture treated by him. Finally, they must treat different branches from the economic standpoint, as well as from the technical side, so that the students can from the beginning have a real idea of rural economics.

In order that this method may be satisfactorily carried out, the instructor must have been trained for the purpose and be provided with suitable and abundant material. Each Chair is provided with an assistant (assistant lecturer), whose duty it is to prepare the material required.

771 - **Rural Continuation Schools.** — KOLATSCHKE, A. W. in *Oesterreichische Zeitung*, Year 4, No. 13, pp. 145-148, Vienna, March 29, 1913.

Rural continuation schools have been established for the purpose of giving to the greater majority of peasants' sons, who are unable to attend an agricultural school, the opportunity of retaining and extending, by means of at least a few hours' instruction in the week, such information as they have acquired in the elementary school.

In Württemberg such continuation schools were started as long as 1857, under the name of "Winter-evening Schools". In 1859 there

eady 180 rural continuation schools, founded by the communes with the assistance of the agricultural societies. In an appendix to the laws relating to the elementary schools, dated November 6, 1858, the attendance at one of the winter-evening schools established voluntarily by the communes was made obligatory for every boy on leaving the elementary school. A Ministerial Decree of February 1, 1866, assured to the communes a State grant to meet half the expenses incurred in founding such schools, and further required the attendance at these schools of all youths between 14 and 18 years of age who had completed the ordinary course of instruction. The Central Office for Agriculture superintends the agricultural portion of the curriculum. In 1867 there were 600 winter-evening schools in Württemberg.

In Rhenish Prussia, agricultural continuation instruction was first given in 1859. There, its introduction and promotion were due to the exertions of the Central Agricultural Union for Rhenish Prussia, which brought before the Government the importance of such instruction and the necessary measures for imparting it. On April 30, 1867, a Government decree was issued with the view of preparing teachers for this work; it required that more attention should be devoted to natural science in the Teachers' College of the Province of Rhenish Prussia and that agriculture should be included in the curriculum.

In the Grand Duchy of Hesse, there were at this date already four manual schools and agricultural winter schools, while from 1831 to 1839 a winter school had existed in Darmstadt. Much is hoped in the future, when there is a sufficient teaching staff, from the effect upon the farmers of peripatetic agricultural instructors.

In Bavaria, a Ministerial Decree of January 25, 1867, introduced Agricultural Continuation Schools; the establishment and superintendence of the winter-evening schools was entrusted to the Agricultural District Committees ("Kreisausschüsse").

In Baden, Freiherr von Babo had succeeded by 1880 in getting agricultural instruction included in the curriculum of 30 village schools. In 1867 there were, however, already 10 agricultural winter schools. Afterwards, Baden also, peripatetic instruction was considered of chief importance.

In Austria, in the years 1848, 1869 and 1872 several general Ministerial decrees also dealt with the promotion of agricultural continuation instruction, in that they allowed, or advised, the teachers to impart it. It was, however, not until September 3, 1875, that a decree was issued containing measures for the establishment and maintenance of agricultural continuation schools. The Imperial Education Law ("Reichsvolksschulgesetz") of May 2, 1882, left it to the district councils ("Landgesetzgebung") to make the necessary arrangements regarding these schools and courses of instruction. The Ministerial Decree of September 2, 1872, had, it is true, made agriculture a compulsory subject in the Teachers' Colleges, but this provision remains in abeyance even at the present time, for the demands made on the time of the students at these Colleges are so manifold that there is no time to spare for instruction in agriculture. In order to remedy this unsatisfactory state of affairs, the writer suggests that during the

summer a five-months' course should be held in the agricultural winter schools in order to qualify young elementary-school teachers to conduct country continuation schools.

772 - **Teaching Manual Work in the Country.** — FAIST in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Part 18, pp. 263-266. Berlin, May 3, 1913.

The writer draws attention to the necessity and the opportunity for introducing into the curriculum of rural elementary and continuation schools a course of manual work adapted to the requirements of the different districts. He gives the general outlines of a scheme whereby the present training of teachers could be modified with a view to their being competent to impart such instruction.

773 - **Technical Instruction in Ploughing.** — MURRAY, A. in *The Journal of the Board of Agriculture*, Vol 20, No. 2., pp. 116-120. London, May 1913.

The writer lays special stress on the importance of practical technical instruction in ploughing, and gives a short description of a course of instruction on this subject (usually lasting 2 days) which was organized some years ago by the Hants County Council, with the assistance of the Hants Agricultural Association. Persons taking the course were instructed in the construction of the various types of ploughs, in their use on different soils and for different purposes, as well as in the actual operation of ploughing. At the conclusion, there was a ploughing demonstration and prizes were distributed.

774 - **Second Practical Course of Wine Analysis by the Physico-Chemical Volumetric Method** (1).

The second practical course of wine analysis by the physico-chemical volumetric method will be given by Messrs. Paul Dutoit and Marc Duboux, Professors of Physical Chemistry at the University of Lausanne. Its object is to acquaint analytical chemists in as short a time as possible with the new methods of analysis by means of electric conductivity which are described in the *Traité d'Analyse des Vins par Volumétrie physico-chimique* (Lausanne, Rouge) (2).

It consists of: 1. Some theoretical lessons relating to the general principles of the method and their application. 2. A considerable amount of practical work, consisting chiefly of analyses, for all those who attend the course. (Each person will be provided for this purpose with the necessary materials for experiment and with an apparatus for determining electric conductivity).

The practical work is so arranged that the determinations which are always required (ash, sulphates, chlorides, tartaric acid, acidity) are made first. The estimation of other constituents of wine (phosphates, potash, lime, magnesia, malic acid, succinic acid, etc.), which the chemist formerly carried out owing to the lack of rapid and accurate methods, are demonstrated

(1) For the programme of the first course, held in 1912, see No. 1133, B. Aug. 1912.

(2) See also P. DUTOIT and M. DUBOUX, *The Analysis of Wines by a Physico-Chemical Volumetric Method*, pp. 2562-2569, B. December 1912. (Ed)

er. Finally, a few examples in the determination of the total alkali and of acidity of wines will show the chemists that the conductivity method enables certain important elements to be estimated which are not detected in ordinary analysis.

The course and practical work will take place in the Laboratory for Physical Chemistry at the University of Lausanne from July 21 to 29, 1913. Persons intending to attend the course can send in their names up to July 1. Address Prof. Paul Dutoit (Solitude 19, Lausanne). The entrance fee is 5 francs and includes admission to the course and to the practical work, as well as the use of the apparatus and necessary materials for analysis.

- Agricultural Shows.

Argentina.

3. October 12-14. Olavarría (Buenos Aires). Cattle Show organized by the Sociedad Rural Argentina.

Australia: New South Wales.

6. February 17-19. Show of the Guyra Pastoral, Agricultural and Horticultural Society. R. N. Stevenson, Secretary.
February 25-27. Show of the Inverell Pastoral and Agricultural Association. J. McIlveen, Secretary.
March 10-12. Show of the Central New England Pastoral and Agricultural Association (Glen Innes). George A. Priest, Secretary.
March 17-20. Show of the Armidale and New England Horticultural Association. A. McArthur, Secretary.
April 29-May 1. Show of the Northern Agricultural Association (Singleton). E. J. Dann, Secretary.

Belgium.

2. Ghent. National Show of the Adulteration of Food at the Universal and International Exhibition at Ghent.
August-September. Malines. Show of Intensive Agriculture organized by the town with the cooperation of the agricultural "comices" of the arrondissements.
Nov. 8-10. Brussels. Show of the Brabantonne Club. For information apply to M. Picard at Nivelles, or to M. W. Collier, 97 Rue des Cailloux, Jette-Saint-Pierre.
November 8-10. Borgerhout, 13 Rue Saint-Joseph. National Poultry Show organized by the Neerhof Society of Borgerhout. Secretary, M. Ing. Dierckx, 221 Chaussée de Turnhout, Borgerhout, Antwerp.
November 15-17. Charleroi. Show organized by the Rabbit Club of the Bassin de Charleroi. Secretary, M. A. Hoc, Place du Sud, Charleroi.
December 20-22. Antwerp. Eleventh International Poultry Show. For information apply, 28 Rue Corfs, Antwerp.

Brazil.

3. September. Rio de Janeiro. National Rubber Exhibition.

France.

1. August 2-4. Amboise (Indre-et-Loire). Horticultural Show.
August 14-17. Maisons-Laffitte (Seine et Oise). General Horticultural Show organized by the Horticultural Society of the town. Apply to the Vice-president of the Society, M. Jacquot, 33 Avenue Longueil, Maisons-Laffitte.
August 20-24. Clermont-Ferrand (Puy-de-Dôme). Show of Agricultural Machines and Implements organized by the Agricultural Comice of the arrondissement, on the occasion of the Congress of the Federation of Mutual Assistance and Agricultural Cooperation.
August 20-25. Clermont-Ferrand (Puy-de-Dôme). Horticultural Show.

- September 6-7. Privas. (Ardèche). Farm competition (prizes for crops) and Public Exhibition organized by the Ardèche Society for the Encouragement of Agriculture. Apply to M. F. Besson, Secretary of the Society, Privas.
- September 6-8. Tarare (Rhône). General Horticultural Exhibition organized by the Horticultural and Viticultural Society of Tarare. Apply to the President of the Society, 70 Rue Savoie, Tarare.
- September 13. Pithiviers (Loiret). Show of beet-lifting machines organized by the Agricultural Society of the Pithiviers arrondissement. Apply to M. L. Lessag Fresne, par Marsainvilliers (Loiret), Secretary of the Society.
- September 13-15. Salies de Béarn (Basses Pyrénées). General Exhibition of all the Products of Horticulture, Viticulture and of the industries connected therewith, organized by the "Syndicat d'Initiative" of Salies-de-Béarn, with the co-operation of the Horticultural and Viticultural Society of the Basses-Pyrénées.
- September 13-21. Arras (Pas de Calais). Second Motocultural Show and Show of Agricultural Motors and "Monobatteuses" organized by the French Motoculture Society. Apply to the General Secretariat of this Society, 58 Boulevard Voltaire, Paris.
- September 27. Boistrancourt sugar-factory on M. de Guillebon's property. Exhibition of beet-lifting machines, organized by the Agricultural Comice of Iwuy (Nord).
- September 28-29. Montmorency (Seine-et-Oise). Horticultural, Viticultural and Fruit Show organized by the Circle of Practical Arboriculture of Seine-et-Oise. Apply to the Secretary-General, M. A. Vigneau, 22 Rue de Pontoise, Montmorency.
- October 9-12. Montpellier. Great Exhibition of the Products of Horticulture and of the Arts and Industries connected therewith, organized by the Federation of the "Sociétés Horticoles du Littoral" with the cooperation of the Hérault Society of Horticulture and Natural Science. Apply, the Secretary-General, M. Vachet, 6 Boulevard l'Observatoire, Montpellier.
- November 6-9. Brest (Finistère). Horticultural Exhibition.
1910. Marseilles. Colonial Exhibition.

Germany.

1914. April 3-5. Cologne. Municipal Market and Abattoir. A Show of Animals for the Butchery and of Fat Animals, annexed to the Exhibition of Agricultural Machines, Implements and Agricultural Products, of Stock-Breeding and the Meat Industry and to Show of Fat Poultry (killed). Apply to the "Direktion des Schlacht und Viehhofes".

Hungary.

1910. September 5-8. Kolozsvár. Seventeenth Show and Market of Stud Animals and Nineteenth Exhibition and Market of Agricultural Machines and Products organized by the Association of the Agriculturists of Transylvania with the support of the Ministry of Agriculture for Hungary.
- October 9-20. Budapest. Horticultural and Viticultural Show. Apply to the National Horticultural Society of Hungary, (Budapest IV, Molnár, No. 25).

Italy.

1912. September 20-21. Cremona. Show of Heavy Belgian Horses and Light Draught Horses of Hackney origin. Last date of entries, August 20. Apply, 8 Via Lungacqua, Cremona.
- September 23-24. Cremona. Show of Milch Cows of the Brown Breed confined to the Breeders of the Province of Cremona. Lungacqua 8, Cremona.

United Kingdom.

1910. November 1-7. London. Royal Horticultural Hall. Thirty-fifth Annual Exhibition and Market of the Brewing Industry. Apply to the Managing Director of the Exhibition, 46 Cannon Street, London, E. C.

14. May-October. Bristol. International Exhibition. Apply to the Bristol International Exhibition Limited, Central Chambers, St Augustine's Parade, Bristol, or to J. Bellham, Esq., 274-277 Bank Chambers, High Holborn, London, W. C.
15. May-October. Manchester. International Exhibition. The Cotton Industry and the Products of the British Colonies will be largely represented: a special section will be devoted to machines.

United States.

16. Day of Opening February 20. San Francisco. Show of New Varieties of Roses. \$ 1000 given in prizes.

6 - **Congresses.**

Belgium.

17. August 18-20. Ostend. Sixth International Fisheries Congress. Address to "Secrétaire général du VI^e Congrès International de la Pêche", Kursaal, Ostend, Belgium.

France.

18. August 22-31. Soissons (Aisne). Second International Congress of Motor Culture, of Agricultural Motors and of Improved Cultural Methods, organized by the French Society of Motor-Culture.

This Congress, which will include an agricultural section and a machine section, will be combined with an international motor-culture competition and an exhibition of motors, machines and implements. For all information, apply to the Secretary General of the Society, 58 Boulevard Voltaire, Paris.

October 1-3. Lyons. First French National Cold-Storage Congress. A cold-storage exhibition will be held in connection with the Congress.

Germany.

19. August 25-28. Trier. General Assembly of the German Forestry Association ("Deutscher Forstverein").

Italy.

20. September 21, Cremona. Zootechnical Congress, Apply, Via Lungacqua 8, Cremona.

Switzerland.

21. Berne. Fourth Congress of the International Professional Horticultural Union.

CROPS AND CULTIVATION.

7 - **Studies on Lateritization.** — 1. BERNARDINI, I. and MAZZONE, G. La laterizzazione nei terreni dell'Italia Meridionale. — *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 146-156. Modena, 1913. — 2. GORTANI, M. Terra rossa, bauxite, laterite. — *Giornale di Geologia Pratica*, Year XI, Part 1, pp. 21-39. Parma and Turin, 1913.

1. Following on the lines laid down by Ulpiani (1), the writers have applied Bemmelen's methods of research to samples of soil from some provinces Southern Italy. It appears that they have found that in that part of country lateritic soils are widely spread and that the weathering of aluminous rocks leads to the prevailing formation of laterite instead of clay. Nevertheless they point out, with Ulpiani, that no certain conclusion can be drawn as to the intensity and diffusion of the process of the formation of laterite in the soil of Southern Italy, on account of the fact that the methods proposed by van Bemmelen for the diagnosis of lateritic soil have not yet been perfected, and also because the number of soils hitherto examined was too small to allow of precise conclusions being reached. At the Royal

(1) See No. 1609, B. Dec. 1912,

(Ed.)

Chemical Agricultural Station of Portici investigations in both directions are being carried out.

2. The writer observes that recently considerable progress has been made in the knowledge of the petrography, chemistry and history of the types of aluminous and ferruginous rocks: red earth, bauxite and laterite. Considering the importance of these rocks, especially from the agro-geological point of view, and the confusion of words and ideas concerning them he examines critically the results hitherto obtained and arrives at the following conclusions:

I. Under the name "red earth", the insoluble residue of limestones and dolomites is designated. It is essentially constituted by aluminium hydroxide, almost always with iron hydroxides and other minerals, sometimes authigenic, at other times to a greater or less extent allothigenic.

II. From the geological, lithological and practical points of view it appears advisable to reserve the name of "bauxite" for those rocks consisting essentially of hydroxides of alumina (and iron) which are included in calcareous formations and which therefore reveal themselves as ancient "red earths".

III. The name "laterite" is to be extended to all rocks essentially formed by hydroxides of alumina (and of iron, titanium and manganese) derived from the alteration of silicate rocks.

In the formation of laterite, doubtless many causes have concurred, some of them taken singly explain the origin of individual deposits, but the causes and general laws which govern this formation are still unsolved problems. In view of this uncertainty, the opportunity of distinguishing the various kinds of laterite as to their age, composition, etc., seems to the writer to be very doubtful, and equally doubtful appear to him the general deductions that some writers infer from local observations or from too special and incomplete researches. In this particular case he doubts the correctness of the above-mentioned conclusions formulated by Ulpiani and his school, because the samples of soil dealt with, coming as they do from calcareous districts, do not appear to be "laterites" but "red earths". The error probably arises from the purely chemical method that has been followed, namely that of taking as a basis the molecular ratio of silica and aluminium soluble in hydrochloric acid.

IV. The process of "ferrettizzazione" (1) is also probably connected with the preceding forms of alteration. The writer considers that a more exact and accurate investigation of this phenomenon would be very desirable both as regards its precise nature and the probable profound differences between the "ferretti" derived respectively from silicious and calcareous rocks.

(1) Formation of "ferretti", ferruginous clays of the sub-alpine alluvial plateaus (Ed.).

- On the Alkaline Reaction which may be caused by Acids and Acid Salts in the Soil. — MASONI, G. (Laboratory of Agricultural Chemistry of the Royal University of Pisa) in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 4, pp. 241-263, Modena, 1913.

It is well known that the reaction of the soil exerts a great influence on its fertility (1). The writer has conducted some experiments either by adding soils containing more or less lime with $\frac{N}{50}$ or $\frac{N}{100}$ solutions of acids and acid salts in flasks, and then examining the liquids, or by mixing the liquids obtained by percolation from the soils treated in flasks or in tubes open at both ends; and he has observed that mineral and organic acids and their acid salts can cause an alkaline reaction in soils.

The explanation of the fact appears to be in the formation of calcium carbonate, not excluding however the possibility of other more general causes, such as the action of the acids on basic salts, which may always be present in soils (lime, magnesia, alumina, etc.). Phosphoric acid and bi-acid calcium and potassium phosphates have shown a special behaviour. The persistence of the acid reaction with phosphoric acid seems to be explained by the formation of mono-calcium phosphate, which, on account of its very weak acid affinity, may remain unchanged, notwithstanding the excess of lime. The alkaline reaction, which nevertheless may be obtained with pure calcium carbonate or with soil well pressed into long tubes, appears to depend on the special conditions which facilitate the ion of carbon dioxide, and consequently the formation of bicarbonate. From the above it follows that it is still more difficult to obtain the alkaline reaction with mono-calcium phosphate. The alkaline reaction which may be had with mono-potassium phosphate is explained by the formation of alkaline carbonate at the expense of the lime.

In connection with these investigations, it is mentioned, from a practical point of view, that the use of mineral acids (sulphuric acid for instance) on just weeds may produce an alkaline reaction in calcareous soils. Ferrous phosphate, which also possesses an acid reaction, on the contrary does not cause an alkaline reaction on account of the formation of insoluble compounds. On the other hand, may be expected for the reasons given above, the use of superphosphates leads to the continuance of the acid reaction.

Of especial interest, lastly, is the question of root secretions. The carbonic acid produced by the respiration of roots must produce in calcareous soils a medium having an alkaline reaction; besides which the acids, which according to various writers are admitted to be secreted by roots, could also contribute to the production of an alkaline reaction in calcareous soils. Experiments made in this connection appear in fact to have demonstrated the production of a distinct alkaline reaction caused by roots in soils containing lime. These experiments will be resumed, especially in connection with the study of the causes of chlorosis.

(1) See No. 42, B. Jan. 1912.

779 — **Some Bacteriological Studies of Old Soils.** — SHARP, L. T. (University of Nevada) in *The Plant World*, Vol. 16, No. 4, pp. 101-115. Baltimore, Md., April 19

The writer had the opportunity of studying soil samples from the collection of Dr. E. W. Hilgard which had been tightly stoppered for from 20 to 33 years; he was thus enabled to investigate the bacterial flora still present in them and the resistance of organisms to drying of the soil, which is a problem of much practical and scientific interest. Of the 9 samples examined, two were taken from alkali soil, two from adobe ridge (surface soil and subsoil respectively), one from adobe 10 to 20 inches in depth, one from black adobe 6 to 12 inches in depth, one from loam, one from foothills sandy soil 1 to 12 inches in depth, and one from rich loam.

The summary of the investigations was as follows:

1. Soils free from excessive alkali salts retained from 75 000 to 570 000 organisms per gram after thirty years drying under room conditions. Alkali soils contained under similar conditions 5000 to 60 000 organisms per gram.
2. The ammonification flora is most resistant, being especially strong in the alkali soils.
3. Nitrification occurs feebly in two soils and is permanently destroyed in the other seven soils.
4. Though *Azotobacter* forms are entirely absent in all but the foothills sandy soil, the nitrogen fixation power of the soils is well maintained in other organisms.
5. There is no relation between numbers and physiological efficiency.
6. The persistency of these organisms under dry conditions and the renewed activity in the presence of sufficient moisture is agriculturally important.
7. The soil exhibits a protective function towards lower forms under adverse conditions.

780 — **The Value of Soil Analyses to the Farmer.** — HALL, A. D. (The Development Commission). — *The Journal of the Royal Agricultural Society of England*, Vol. LXXXIII, pp. 1-9. London, 1912.

After having dealt with the subject at length, the writer thus summarizes the present position of soil analysis:

1. Mechanical analysis enables us to classify soils and assign each an unknown example to its type.
2. From the type, combined with knowledge of the situation and climate, we may predict its suitability or otherwise for particular crops.
3. Chemical analysis will tell us whether a soil is getting acid or needs liming to make it work properly and utilize the manure supplied to it.
4. From chemical analysis we can settle what class of manures ought to be used — whether sulphate of ammonia or nitrate of soda, superphosphate or basic slag.
5. Chemical analysis will often reveal particular deficiencies and the specific need for phosphates or potash, but to do this with any certainty the composition and behaviour of soils of that type should be known from previous soil survey.

The writer draws attention to the fact that abnormal soils have frequently to be dealt with, and in order to attack the problems presented such soils it is necessary in the first place to accumulate information, data as to the nature and composition of known soils, and in the second place to increase our knowledge and perfect our methods of analysis.

— **Irrigation in Egypt and the Nile Dams.** — LUIGI, I. in *Annali della Società degli Ingegneri e degli Architetti Italiani*, Year 18, No. 10, pp. 263-279. Rome, May 12, 1913.

In ancient times Egypt was the best irrigated country in the world. The waters of the Nile were used for fertilizing and irrigating the country. Through imperfect upkeep the works were allowed to fall into decay and lost their importance. Only during the last decades new works have been undertaken which restore to the Nile its former importance. New dams have been built and the network of canals has been extended. The most important barrage is that of Assouan. Fig. 1 shows its cross-section and gives chief dimensions in metres (1 metre = 39.37 inches). Fig. 2. shows the cross-section of some of those preliminary works that had to be made to drain certain localities.

The total cost of this work amounted to about £ 10 500 000, but the advantages produced by it exceeded all expectations. The yearly rent of land, which averaged before 1894 about £ 3 12s 6d per acre, rose to 13s 6d, and principally because, whilst formerly only one crop a year was possible, now two and sometimes three are attainable and cotton growing becomes common. Lucerne gives as many as twelve cuts per year.

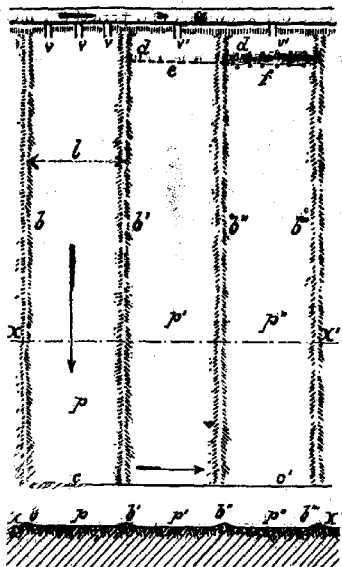
The rental value of the soil has risen from £ 15 500 000 per year in 1894 to £ 34 500 000 in 1910; that is, the yearly increase amounts to 9 000 000, or almost twice as much as the cost of the whole work.

— **Irrigation on Narrow Strips.** — RINGELMANN, M. in *Journal d'Agriculture pratique*, Year 77, Vol. 1, No. 19, pp. 599-601. Paris, May 8, 1913.

When irrigation by flooding has to be carried out on fields having very slight fall ($\frac{1}{2}$ or 1 per 1000) and a considerable length, it becomes necessary to diminish the breadth of the field in order to prevent the formation, in some points, of currents which would erode the soil.

This erosion of the soil can never be completely avoided, especially when considerable quantities of water are used, but it can be much reduced when the breadth of the strip to be watered is diminished, and this can be done, as is shown in the accompanying figure, by dividing the field into long narrow strips (p, p', p'') limited on each side by small embankments (b, b', b''). The breadth of these strips is from 16 to 33 feet. Their length varies between 100 and 200 feet, in some instances 500 and even 2600 feet, but this method is not advisable, for, as is well known, with the increasing length of the strip the oxygen content of the water diminishes. The height of the little embankments between the strips varies from 2 to 4 inches and their breadth between 12 and 24 inches. In the annexed figure the irrigating channel is shown in (a) and the out-drain in (c, c'). In order to prevent erosion taking place at the

upper end of the field either several openings (v) are made at distance of 10 feet from each other in the irrigating channel, or only one opening



leading into a small reservoir (a) whence it flows through a barrage (e) onto the field.

In the second part of the paper the writer describes a case in which this system has given excellent results.

783 - **Thirteen Years of Experiments with Farmyard Manure at the Askov Experiment Farm, 1898-1910.** — 49th Circular of the State Service for Agricultural Experimentation, Copenhagen, March 28, 1913. Communicated by the Danish Office of International Institute of Agriculture.

Experiments conducted with the following soils and rotations :

Light loamy soil	{ Rye. Hoed crops. Oats. Seeds. Seeds, or mixture of $\frac{3}{5}$ barley and oats, $\frac{1}{5}$ peas and vetches.

High, dry sandy soil . . .	Rye.
	Hoed crops.
	Oats.
	Seeds, or above mixture.

During the last four years the seed-ley was no longer kept down a second year, so that the rotation was the same for both soils.

Different amounts of dung given at the same time. — The yearly quantities applied were respectively, 5000, 10 000 and 15 000 Danish pounds per tondeland (1), divided as follows: on the loam soil, during the first year $\frac{2}{3}$ to the rye, $\frac{1}{3}$ to the hoed crops and $\frac{1}{3}$ to the oats; during the last years $\frac{3}{4}$ were given to the hoed crops. On the sandy soil one half was given to the hoed crops and the other half to the oats; besides the control plots were made, no manure being given to them.

Average results in fodder units per tondeland.

	Loam soil lbs.	Sandy soil lbs.
Unmanured plots	2663	1414
Plots with 5000 lbs dung per year . .	3181	—
Plots with 10 000 lbs. " " "	3518	2583
Plots with 15 000 lbs " " "	3807	2998

Referring the excess of crop to the quantity of dung used, the following relative data are obtained.

*Excess of crop in fodder units referred to every 1000 lbs.
of dung per tondeland.*

	Loam soil lbs	Sandy soil lbs
Plots with 5000 lbs. per acre .	104 (156)	—
" " 10,000 " " "	86 (117)	117
" " 15 000 " " "	76 (98)	106

The data in brackets represent the results of a series of experiments in which the crop on the control plots was smaller.

The principal result of these experiments is that the useful effect of the manure diminishes considerably with the increase of the quantities employed. In loam soil this decrease was from 12 to 16 per cent. of the excess of crop in passing from a medium to a heavy application of dung; on sandy soil the decrease was 10 per cent.

Different times of application of dung, with or without liquid manure. — During three different amounts of dung on the loam soil and only one on sandy soil, the dung was applied to some plots of hoed crops and oats in the spring (April or early May) and to the other plots in the preceding autumn (November). For rye the manure was given immediately be-

(1) The Danish pound = 1.1023 lb.; the tondeland = 1.36 acre.

(Ed.).

fore sowing, usually at the beginning of September. The stable manure retained about the same amount of plant food in autumn as it did in spring.

The liquid manure was given in spring to half of the plots on loam. In the first years it was given both to the hoed crops and to the sley; to the former in doses of 20 000 lbs. per tonde land and to the latter of 10 000 lbs. In recent years the amounts were proportional to amount of dung applied and they were given only to the hoed crops.

Average crops in fodder units per tonde land.

	Loam soil	Sandy soil
Plots manured in autumn without liquid manure	3 453	2 281
Do. in spring without liquid manure	3 551	2 589
Do. in autumn with liquid manure	3 767	—
Do. in spring with liquid manure	3 809	—

On loam soil the use of manure in autumn as compared with its use in spring yielded 3 per cent. less of the total crop when liquid manure was not given in the following spring, but when this was given to hoed crops and to seed-leys forage plants the loss was reduced to 1 per cent. The liquid manure not only contributed to increase the crops, but also diminished the loss due to the application in autumn; in fact these losses with hoed crops, were 4 and 8 per cent. accordingly as the liquid manure had been applied or not and with oats 2 and 5 respectively. In sandy soil the average loss due to the application of manure in autumn was 12 per cent. of the total crop, distributed among the various crops as follows: 3 per cent. for rye, 16 per cent. for beets, 7 per cent. for potatoes, 19 per cent. for clover and 6 per cent. for seeds.

The liquid manure applied to clayey soil manured in autumn produced an increase in the crop of 15 fodder units per lb. of nitrogen, but only 13 when given with spring manuring. The average content of the liquid manure was 0.338 per cent. of nitrogen and 0.635 per cent. of potash.

784 - Action of Fermenting Manure on Reënforcing Phosphates. —

TINGHAM, W. E. and HOFFMAN, C. (Agricultural Chemistry and Bacteriology Laboratories, Wisconsin Experiment Station, Madison). in *The Journal of Industrial Engineering Chemistry*, Vol. 5, No. 3, pp. 199-209 + figs. 3. Easton, Pa., March 1913.

Considerable evidence has been accumulated which indicates advantage from the use of finely ground rock-phosphate directly as a fertilizer, especially when it is applied in conjunction with a liberal supply of organic matter. The work described in this paper includes studies of the action of fermenting manure on rock-phosphate or floats (rock-débris). The fresh manure free from litter (a mixture of $\frac{1}{3}$ horse manure and $\frac{2}{3}$ cow manure unless specified otherwise) was thoroughly hand-mixed with floats in proportion of 1 lb. of floats to 50 lbs. of manure. The samples were fermented in covered iron pails; and water was added occasionally in earlier experiments to maintain a fairly even moisture content of the dry and reënforced manures.

Fermentation over periods of 4 to 6 months caused a decrease of water-soluble phosphorus in manures and mixtures of manures with rock-phosphate. The losses were greatest in the mixtures, where they amounted to more than one-half the soluble phosphorus originally present. Ammonium carbonate solution and fifth-normal nitric acid did not recover this depressed phosphorus in all cases and hence other changes than simple reversion of insoluble phosphates apparently occurred.

Ammonium carbonate solution of the strength existing in the moisture fermenting manure was no more efficient than water as a solvent for phosphorus in fermented manures and manure-phosphate mixtures. A saturated solution of carbon dioxide was not superior to water as a solvent for phosphorus in manures and mixtures which had fermented about two and one-half months, and in which bacteria were active, but was superior when fermentation had covered 10 months and the bacteria had become practically inert, was five times as efficient as water or the ammonium carbonate solution solvent power for phosphorus of rock-phosphate. The addition of either proform or formaldehyde, which practically inhibited bacterial action, greatly reduced the losses of water-soluble phosphorus in mixtures of manure and rock-phosphate.

Dry bacterial cells of manure organisms grown on agar media contained about 8 per cent. phosphoric acid. The growth of manure organisms upon media supplied with the soluble phosphorus of fresh manure or rock-phosphate mixtures depressed the water-soluble phosphorus of the media by amounts which were comparable to the losses of water-soluble phosphorus observed in fermenting manures. About one-half the phosphorus of fresh intact bacterial cells was soluble in water. This phosphorus was apparently derived from inorganic phosphates absorbed from the media. The remaining phosphorus of the cells was probably present in nucleic compounds.

Acid-phosphate incorporated with the fermenting manure underwent practically the same changes of solubility as rock-phosphate. In the presence of chloroform, however, the acid-phosphate decreased markedly in solubility, while with rock-phosphate no decrease occurred. Application of monocalcium phosphate to barley in pot experiments gave greater immediate returns when the phosphate was applied with previously fermented manure than when it was applied in a fermented mixture of manure and phosphate. The immediate returns from tricalcium phosphate were the same whether it was applied with previously fermented manure or in a fermented mixture. A second crop of barley from the original application of reinforced manures gave a superior yield from the fermented mixture for both phosphates.

In conclusion this work requires confirmation under field conditions before it can be applied to direct agricultural practice. However, so far as the experiments indicate conditions in field experience; the final results from using rock-phosphate with fermenting manure appear to be advantageous. In the case of acid-phosphate it appears inadvisable to mix the material with fermenting manure. It is probably better practice to add it to the manure at the time of application to the field.

783 - The General State of the Nitrate Trade in 1912 and in the Beginning of 1913. BROWN, A. G. (gerente Nitriao) in *Asociación Salitrera de Propaganda Circular Trimestral*, No. 59, pp. I-LIII, Iquique, April 15, 1913.

The following data, which complete those published by the International Institute of Agriculture in *Production et consommation des engrais chimiques dans le monde*, (1913), are taken from the last Report of the Directors of the "Asociación Salitrera de Propaganda" to its members:

	In 1912: tons	In 1911: tons	Difference:
Production according to the data communicated by the establishments	2 545 938	2 482 112	+ 634
Exportation	2 454 602	2 411 707	+ 428
Consumption	2 490 502	2 363 299	+ 1272

The figures corresponding to the first six months of the "salitren year, July to December, were as follows:

	July 1 to Dec. 31 1912: tons	July 1 to Dec. 31 1911: tons	Difference tons
Production	1 329 610	1 255 281	+ 74 329
Exportation	1 429 821	1 432 404	- 2 583 in 191
Consumption	749 906	659 114	+ 90 792 in 191

The stocks visible on December 31 were:

In 1912: tons	In 1911: tons	Difference: tons
1 594 357	1 667 657	6 604 304

As a complement to the above, the following are the figures dealing with the consumption in Europe during the months of February and March 1913, compared with those of the preceding year.

	In 1912: tons	1913: tons	Difference:
February	307 430	233 160	74
March	436 240	355 470	80

Smaller amount of consumption . . . 155

According to the market reports of some of the principal firms this decrease of consumption is due to the insufficient quantity of nitrate of soda in the ports of delivery compared with the demand, which in its turn caused by the slackening of transport by sea owing to the English coal strike of 1912

- **Cyanamide, Dicyandiamide and Nitrolime.** — DE RUIJTER DE WILDT, J. C. and BERKHOUT, A. D. (Rijkslandbouwproefstation te Goes) in *Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouw-proefstations*, No. XIII, pp. 61-116 + XXIX Tab. + app. The Hague, 1913.

This is a continuation of previous investigations with special regard to chemical factors in the phenomena of the transformation of nitrolime. In the investigations the cyanamide was determined by weight as a mercuric salt.

Stability of cyanamide in the dry state. — The titration of pure cyanamide kept for two years in a state of dryness diminished from 98.1 per cent. to 94.1 per cent.

Stability of cyanamide in solution. — Of two solutions of cyanamide in water, one containing 0.25 and the other 1 per cent, kept for fifteen months, the first may be considered as practically stable, only the titration of the second diminished somewhat, namely from 98.3 to 94.3 per cent. Solutions of 0.5 per cent. were kept at normal temperatures, at 40° C. and at 20° C. for a month and a half; in the first case the solution kept almost unchanged, at 40° and 60° the transformation was more marked. A solution of 2 per cent. cyanamide concentrated to dryness on sulphuric acid for 9 days still retained 90.4 per cent. of the original quantity of cyanamide; the same solution boiled in an apparatus with refrigerator contained after 40 minutes 90 per cent. of the original quantity; lastly, evaporated almost to dryness in a water-bath it was transformed almost entirely into dicyandiamide.

Action of salts, acids and bases on cyanamide solutions. — A solution of 1 per cent. of cyanamide was treated for three years with $\frac{N}{50}$ solutions of ammonium, sodium, calcium and potassium chlorides, of sodium and ammonium nitrates, of ammonium sulphate and suspended calcium carbonate; the calcium salts caused a sensible transformation into dicyandiamide; the presence of chlorides caused a diminution of the nitrogen in the silver precipitate. On experimenting for 7 months and under equal conditions with the neutral potassium phosphates it was found that a formation of dicyandiamide took place with bi-potassium phosphate and still more with the neutral salt. Similarly, experimenting for two months with solutions containing 0.5 and 1 per cent. of cyanamide and $\frac{N}{50}$ solutions of sulphuric, hydrochloric and nitric acids, of ammonium, sodium and calcium hydrates, it was found that with the acids the formation of urea took place to the same extent, while the formation of dicyandiamide is more intense with the bases and especially with calcium hydroxide; besides, it appears that the degree of concentration has more influence than the quantity of the bases and acids present; thus a very weak solution such as carbonic acid, after a month, had had scarcely any action.

The writers do not find any alteration due to surface tension or to the presence of iron. In this connection the eventual action of enzymes is to be investigated, as they might explain the conflicting opinions held on the toxicity of calcium cyanamide as a fertilizer.

Dicyandiamide. — The writers propose determining dicyandiamide transforming it into guanilurea by the action of acids and then precipitating it as picrate. The solutions of dicyandiamide in themselves are stable; transformation takes place quantitatively with an excess of acid, but high degree of acidity is not favourable.

Behaviour of solutions of nitrolime and of lime-nitrogen. — The transformation into dicyandiamide was observed, and also that it was more rapid in concentrated solutions. The formation of ammonia was rarely observed in many years.

Behaviour of nitrolime and of lime-nitrogen (1) in well closed vessels. Of two commercial samples of nitrolime and of two of lime nitrogen, or two of the latter underwent sensible transformations, probably owing to the moisture they had previously absorbed. This shows the possibility of alterations taking place even in well closed vessels, and the writers conclude after several experiments that the alterations of nitrolime are due only to dampness and not to the action of carbonic acid.

Mixture with other fertilizers. — The following results were obtained keeping in well closed flasks several samples and observing the quantity of ammonia that was absorbed by a titrated solution of sulphuric acid situated in small tubes within the flasks.

Losses of ammoniacal nitrogen in milligrams.

January 31, 1908	April 9 1908	July 31 1908	Dec. 7 1908	June 14 1909	Nov. 4 1909	Total
10 grams nitrolime	9.1	61.74	6.58	4.76	5.88	88
do + 10 grams water	70.28	12.32	12.32	8.54	9.52	112
do + 10 " potassium-magnesium sulphate	7.98	41.44	11.62	9.66	9.94	80
do + 20 grams kainit	20.02	35.42	8.4	8.68	10.22	82
do + 20 " superphosphate	0.14	20.44	27.72	19.46	19.18	86
10 grams lime nitrogen	14.84	32.34	5.6	5.74	7.0	65
do + 10 grams water	45.64	9.94	8.12	8.82	10.22	83
do + 10 " potassium-magnesium sulphate	10.36	30.24	7.84	7.7	9.24	65
do + 20 grams kainit	18.48	22.82	6.44	6.44	8.82	63
do + 20 " superphosphate	0.14	33.60	18.48	14.98	10.22	75

(1) See INSTITUT INTERNATIONAL D'AGRICULTURE. *Production et consommation des engrais chimiques dans le monde*, 1913.

At the end of these experiments all the nitrogen present was transformed to dicyandiamide; noteworthy is the increase of temperature when mixed with superphosphate, without however loss of ammonia taking place. In conclusion nitrolime may be mixed with the above fertilizers without any loss of nitrogen, even if the mixture be made some time before using it. There is only the danger of retrogradation with superphosphates consequently it is advisable to mix with kainit when nitrolime is to be used some time before sowing.

Effects on germination. — The final results may be given of some experiments begun on July 13 with white mustard in cylinders containing actively peaty, gravelly, sandy and loamy soils. They were calculated finally on July 20 by multiplying the number of well-developed plants by average height. Except for the gravelly soil the highest index was obtained with nitrate of soda; next comes that of the untreated soils and those treated with guanilurea which is only equalled or exceeded by dicyandiamide on loamy soil; then follow dicyandiamide and old and transposed nitrolime which behave almost alike; the least favourable results are those obtained by cyanamide and nitrolime which present about the same parallelism.

Pot-culture experiments. — The principal result of these experiments conducted in 1911 and 1912 with white mustard is that old and altered lime has next to no useful effect, the eventual fertilizing action being negated by its toxicity.

Conditions of sale. — Following on an understanding between the "Versvereinigung für Stickstoffdünger" of Berlin and one of the writers on behalf of the Dutch Experiment Station it was agreed that for Holland lime was to contain at least 70 per cent of its total nitrogen under the form of cyanamide nitrogen with a margin of 5 per cent. This limit is easily exceeded in the factories and anyhow the effect of dicyandiamide nitrogen cannot be compared to that of cyanamide nitrogen. Attention is also drawn to the disadvantages due to the presence of calcium carbide.

The writers intend to continue their investigations.

Lime Rich in Silica as Manure. — IMMENDORF, H. *Die Landwirtschaftlichen Versuchs-Stationen*, Vol. LXXIX-LXXX, pp. 891-901. Berlin, 1913.

The writer in a series of experiments with several calcareous materials ranging from 0.03 to 19.51 per cent. of silica soluble in hydrochloric acid in six loams containing from 17.90 to 36.18 per cent. of clay and from 25.97 to 75.97 per cent. of sand, did not find any of the inconveniences only mentioned by various writers. The conclusion which he draws from manuring with quicklime containing silicic acid acts on the soil in the same manner as manuring with ordinary quicklime. The formation of lent-like concretions can be completely avoided by carefully spreading lime on the soil and mixing it in well during favourable weather. It has been noted that the hydrated silicic acid that is formed has no special action, since it increases the absorbent power of the soil.

783 - **The Relation of Lime to Magnesia in Soils.** — VOLCKEN, J. A. (The
burn Experimental Station of the Royal Agricultural Society of England, Pot-
ture Experiments 1910-11-12) in *The Journal of the Royal Agricultural Society*
England, Vol. LXXIII, pp. 325-338 + Plates 9-11. London 1912.

Continuation and conclusion of pot-culture experiments begun in 11
on wheat:

a) in soil containing 0.40 per cent. of lime and 0.20 per cent. of magne
with the addition of magnesia, and magnesia and lime, in various p
portions;

b) in soil containing 0.83 per cent. of lime and 2.29 per cent. of magne
with the addition of lime in various proportions.

The general conclusions of the writer are:

1. That magnesia may, with advantage to the wheat plant, be add
to a soil poor in magnesia, so long as the amount of magnesia in the
does not exceed that of lime.

2. That as the ratio of lime to magnesia approaches 1:1, a benefit
continue to accrue, but that if magnesia be in excess, a toxic influence
be exercised and the crop be diminished.

3. That soils in which magnesia is in excess of lime will not give fu
satisfactory results as regards corn-growing, but will be benefited by
addition of lime.

4. That lime used in excess does not possess the toxic influence wh
magnesia similarly used has.

5. That magnesia and lime alike are capable of modifying the grow
of the wheat plant, altering the nature and extent of the root developm
and the character of the grain. These modifications are mainly shown
the stronger and greener appearance of the flag, the production of a m
developed and very fibrous root growth, and the greater assimilation
nitrogen, resulting in the obtaining of a more glutinous grain.

The writer gives the results of a field experiment.

On a plot 36 sq. feet in extent divided into two equal parts, one of wh
contained 0.77 per cent. of lime and 0.20 per cent. of magnesia and the ot
0.77 per cent. of lime and 0.40 per cent. of magnesia, Squarehead's Mas
wheat was grown in 1910-11, but as the crop was destroyed it was res-
and the following results were obtained:

	Grain lbs.	Straw lbs.	Percentage of nitrogen in grain
With 0.20 per cent. of magnesia.	2	4 1/4	1.77
" 0.40 " "	3	6 3/4	2.17

The commercial value of the grain obtained from the plot with 0.40
cent. of magnesia was estimated at 1s 6d per quarter more than the oth

The Influence of Lithium, Zinc and Lead Salts on Wheat. — VOELCKER, J. A. The Woburn Experimental Station of the Royal Agricultural Society of England, Pot-Culture Experiments, 1910-11-12: Hills' Experiments) in *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 314-325 + Plates 1-8. London, 1912.

These investigations are a continuation and conclusion of pot experiments on wheat, the first of which was made in 1898 with lithium salts; in 1901 experiments were begun with salts of zinc, and in 1912 with salts of

The first and principal conclusion drawn from these experiments is the presence in the soil of quite small quantities of what are termed the 'ter constituents' has a far greater influence on vegetation than has hitherto been supposed.

As for the results special to each substance it was found:

a) Lithium:

- 1) That in the form of any of its salts it produces a toxic effect if it is present in the soil to the extent of 0.003 per cent. or above.
- 2) That the toxic effect is greater the more lithium there be present and that the form of nitrate is the most toxic.
- 3) That when present in the soil in an amount not exceeding 0.002 per cent. lithium possesses a stimulating influence.
- 4) That among all the salts of lithium, the nitrate would seem to be the most stimulating salt and to produce the best results when not in excess of 0.001 per cent.
- 5) That the action of the salts of lithium on vegetation is exerted mainly in the early stage of the germination of the seed.

b) Zinc.

- 1) That its salts when present in the soil in amounts exceeding 0.03 per cent. produce a toxic effect; below this quantity they possess a slightly stimulating influence, more noticeable with the more soluble salts especially with the nitrate.
- 2) The toxic and the stimulating influences of zinc are about one-tenth those of lithium.

c) Lead.

- 1) That when it is present to the extent of 0.03 per cent. it does not possess any toxic influence upon vegetation; on the contrary the nitrate, at that amount present, would seem to possess stimulative properties.
- 2) That further experiments are needed to determine the amounts that can be safely or advantageously used.

The writer lastly considers it necessary that similar researches be now extended to other crops in order to ascertain whether, as upon wheat, minute quantities of certain metallic compounds exercise an action capable of bringing about changes in their development, root formation and even in the nature of the grain produced.

790 — **Annual Report for 1912 of the Consulting Chemist.** — VORLICKER, J. A. *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 276-282. London, 1912.

Amongst the questions relating to the control of fertilisers and feeding stuffs, the writer refers to a) the use of sawdust — in its raw or prepared condition — as a constituent of feeding cakes or meals; b) the so-called solubility of basic slag. He considers that sawdust is not a proper material for use for stock, while the question of the solubility of basic slag still remains unsolved. He calculates further that the fertilizing value of hop b which is lost when the latter is carted off the land instead of being burnt and spread in the form of ashes is 6s 6d per acre.

791 — **Studies in Nitrogen Nutrition in Plants.** — POUET, I. and CROUCHAK, in *Annales de la Science Agronomique*, Year 30, No. 4, pp. 281-302. Paris, April 1911.

The following experiments were carried out with eight different soils — A to H — each of which was distributed in 6 pots. The pots contain 3.8 kilograms of soil. Two in each series received in addition a sufficient quantity of potassium phosphate, potassium chloride, and calcium nitrate to supply 1 gr. of P_2O_5 , 1 gr. of K_2O , and 1 gr. of N respectively; three others received the same dressing without the nitrate, and of the two were used for measuring the crop while the other was used for sampling; the sixth pot of the series remained uncropped and served as control for estimating the nitrification going on in the soil. A moisture content of 18 per cent. was adopted in the earlier stage of the experiment and later increased to 21 per cent. as the weather got hotter; it was maintained by means of a daily watering on a balance. Millet seedlings were planted on February 27th. On April 30th one third of the crop in each pot was harvested and the soil was sampled at the same time. On June 1st the remainder of the crop was harvested, fully mature, and the soil was again sampled.

In every case the plants receiving nitrate produced bigger crops, the increase varying with the different soils, and the duplicates agreed very well together. Taking the crop with nitrate as 100 in each series, the crops without nitrate were as follows:

Soils	April Harvest	June Harvest
A	18.9 %	20.6 %
B	14.7	14.4
C	47.0	19.7
D	28.6	17.9
E	61.3	37.2
F	43.5	63.3
G	83.5	80.9
H	56.0	43.4

The total nitrogen in the soils does not vary much and could in no way account for the varying effect of the nitrate application.

The process of nitrification in the soil receiving no nitrate was followed by analysing samples drawn from the uncropped pot at the start

the time of the two harvests. No considerable accumulation of nitric gen took place in any of the soils, and in G, which was the only one a fair amount of nitrogen to start with, denitrification actually occurred.

Total per cent.	Nitrogen in parts per million					
	At the start		April 30		June 6	
	Ammonia	Nitrate	Ammonia	Nitrate	Ammonia	Nitrate
13	2.1	5.2	4.5	7.4	8.3	9.1
08	0.9	2.5	1.7	2.4	4.8	0.0
13	11.5	5.1	8.7	16.2	6.6	20.4
12	6.3	3.2	3.4	9.9	3.1	15.0
11	9.0	16.8	5.4	15.0	4.0	18.4
16	12.0	10.3	3.4	23.5	7.1	23.5
11	7.1	37.4	20.2	26.4	4.9	20.8
06	8.9	15.1	6.1	12.5	7.6	15.2

the writers attribute this to the daily watering which they consider sufficient to saturate the soil and inhibit nitrification. They were unfortunately unable to analyse the April crop, but assuming that it contained only 3 per cent. of nitrogen, the nitrogen content of the crop was greater in every instance than the sum of the nitric and ammoniacal nitrogen in the uncropped soil from which they concluded that the plants must have been able to obtain the organic nitrogen directly. Their conclusion was confirmed by the field observations at Algiers, where nitrification is frequently temporarily inhibited by heavy spring rains without impeding the activity of vegetation in any way.

Again, though no correlation could be established between the production of nitrates and the yields obtained, the writers show that there exists a direct relation between the total soluble nitrogen in each soil and the yield. The total soluble nitrogen was estimated by two methods: in the first 100 gr. of soil were put into a glass tube of about 1 inch diameter, water was allowed to percolate through it continuously. Every 24 hours the percolate, which amounted to about 60 cc., was collected and analysed. The amount of nitrogen going into solution diminished rapidly in the first few washings, and after that tended to remain constant, indicating a state of equilibrium between the reserve of nitrogen in the soil and the water. In order to investigate further this so-called point of saturation concentration, 4 gr. of soil was treated with 1 litre of water to

which a few drops of chloroform had been added to stop bacterial action and left in contact for a week with an occasional shaking. In this it was found that the more soluble portions were all removed in the first washing and a state of equilibrium then attained. The writers have shown in previous works that the growth of plants varies with the concentration of the solution in contact with their roots (1).

With regard to the nitrogen supply in an unmanured soil, the plant growth should be at first in proportion with the total "available" nitrogen, i. e. that which goes into solution in the first few washings, but when it becomes exhausted the plants would depend on the solubility of the residue or in other words on the point of limited concentration. In the experiments under consideration the April harvest should therefore be determined by the total available nitrogen, while the June harvest should be influenced rather by the limited concentration point. The results are given below:

	Total available parts per million	Point of limited concentration parts per million
A	27.0	0.184
B	16.8	0.160
C	28.8	0.165
D	21.2	0.162
E	32.4	0.190
F	55.2	0.215
G	188.5	0.140
H	78.1	0.210

The agreement is good and in the June harvest the only big discrepancy is soil G, which, as mentioned before, had an exceptionally large nitrate content at the start which probably carried it through the growing period.

792 - **The Effect of Artificial Shading on Plant Growth in Louisiana.** - See H. L. in U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin No. 1-29. Washington, April 1913.

Two long wooden frames, each 24 by 6 feet, were covered by sections of cloth of five different textures which reduced the light intensity with the frames to $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{7}$, $\frac{1}{15}$, $\frac{1}{25}$ of the normal respectively. A section was left uncovered and there were no partitions between the sections. One of the frames (A) was further provided with an electric fan but the variation in temperature and humidity between the two frames proved to be very small. In the two months (April and May) during which the experiment was running, about 70 per cent. of the possible sunshine was recorded.

Maize, potatoes, cotton, radish, mustard, and lettuce were used in the trials, and measurements of the green weight per plant, of the height and of the diameters of the stems were taken after 30 days, and again:

(1) See No. 235 B. March 1913.

days when the experiment was discontinued. The relative green weights of the plant were as follows :

Light intensity	$\frac{N}{1}$		$\frac{N}{2}$		$\frac{N}{5}$		$\frac{N}{7}$		$\frac{N}{15}$		$\frac{N}{95}$	
	A	B	A	B	A	B	A	B	A	B	A	B
30 days												
maize	100	100	77	94	55	45	30	32	8	5	2	0
potato	100	100	129	57	130	54	168	33	65	26	34	33
tomato	100	100	60	92	68	123	114	49	23	31	12	12
fish	100	100	108	68	79	77	63	48	50	88	0	0
stard	100	100	70	99	72	123	69	77	16	16	0	0
50 days												
maize	100	100	62	94	84	46	47	7	35	0	0	0
potato	100	100	238	146	139	250	282	160	44	27	28	23
tomato	100	100	223	178	91	177	63	31	18	10	0	0
fish	100	100	228	107	157	119	103	55	3	1	0	0
tuce	100	100	129	107	124	107	106	147	4	9	0	0

During the first period of the experiment growth was on the whole distinctly better in full light, while in the second period only maize shows a sun-loving plant. The growth of the other plants increases with light even when the light intensity is reduced to $\frac{N}{7}$.

Similar experiments are now being carried out in Colorado in relation to drought resistance investigations in the semi-arid portions of the United States.

The Resistance Offered by Leaves to Transpirational Water Loss. — JAMES H. HUNTER, B. E. in *The Plant World*, Vol. 16, No. 1, pp. 1-35, Baltimore, Jan. 1913. The writer elaborated a method of measuring the relative rate of transpiration in plants by means of standardised cobalt chloride paper and a free water surface, the results being stated in terms of the free water surface called the "index of transpiring power". The method was checked by use of readings from two atmometers and hourly weighings of sealed plants, which though not absolutely confirmatory showed considerable agreement, but only two sets of readings are available for comparison high to base the reliability of the new method. Results of several field

trials are given and indicate that the method should prove of great value in ecological studies, but many more tests will have to be carried out before any reliable generalizations may be attempted.

794 - **Natural Root-Grafting.** — HOWARD, A. in *The Agricultural Journal of India*, Vol. VIII, Part II, pp. 185-189. Calcutta, April 1913.

The harmful effect of trees on the surrounding vegetation is well known to cultivators in India, who recognise that some species do more damage than others, and when the botanical area of the Pusa Experimental Station was laid out, an attempt was made to limit the effect by digging a trench each year between certain trees and the adjacent cultivated area. In the case of bamboos and of certain other trees this was quite successful, but in other cases, for instance with pipal (*Ficus religiosa*), banyan (*F. benghalensis*) and teak (*Tectona grandis*), negative results were obtained and when thin patches of the crop were examined in the surrounding land, tree roots were found under the surface up to 217 feet distant from the parent tree. The old trenches were carefully opened up in 1912, and it was found that the severed roots had become connected again. New roots had been formed at the cut extremity, they had grown across the width of the trench, which was 24 to 30 inches, united with the severed portion of the root by a process of natural grafting followed by a rapid thickening of the connection which attained a thickness of 0.8 to 1.1 inches in 12 months. Moreover a trench 6 feet deep proved insufficient to intercept all roots, apart from their faculty of reuniting, the roots of the pipal and banyan, which may be 10 to 12 feet deep in the immediate vicinity of the tree, will come to the surface again further off and enter into competition with the crop.

795 - **Experiments in Wheat Breeding: Experimental Error in the Nursery. Variation in Nitrogen and Yield.** — MONTGOMERY, E. G. — U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 269, 61 pp. Washington April, 1913. The data obtained in the wheat breeding experiments carried out during the 5 years 1905-1910 at the Nebraska Agricultural Experiment Station have been gathered together for the purpose of determining the experimental error in the nursery stage, i. e. the stage at which selection is usually made.

The standard plot adopted at the above station is the "centgene" plot 5 feet square containing 100 plants 6 inches apart each way; single rows and larger plots are also used.

In the first part of the bulletin the writer considers the experimental error in relation to the nitrogen content of the grain.

Individual plants in 10 adjacent centgenes and in 10 corresponding rows of 100 plants each, were analysed and the results were grouped in various ways, as were 2-foot sections of a 220-foot drill, also longer rows of 10 and small plots 5.5 feet square. The results show that wheat plants under nursery conditions vary considerably in their nitrogen content, the highest being in one case from under 2% to over 5%, but the variations are inherited and must therefore be due to environment; moreover this variation

restricted to individual plants, but occurs also, though to a less extent, in centgeners, rows, or small plots are taken as units. The best means of reducing the experimental error proved to be to take a small unit, and to make a large number of determinations; for example: single plants 40 determinations; 16-foot rows 5 to 10 determinations and centgeners 8 to 16 determinations; and the method finally adopted as being the most practical for comparing strains on the basis of their nitrogen content consisted of 12 to 16 feet long repeated 10 times in different parts of the field. In the second part of the bulletin the writer treats of the experimental error in relation to yield, which is usually the factor of primary importance in the production of new varieties. As in the previous part of the bulletin various sized rows and plots were considered and grouped together in different ways. When 16-foot rows were adopted it was found necessary to repeat them 10 to 20 times, and the greater the number of strains the greater the number of repetitions required on account of the increased area occupied by the trial. Small blocks, 5.5 feet square, on the other hand, repeated only 8 to 10 times gave equally accurate results. Increasing the length of the row or the size of the block decreased the variability, but not to the same extent as repeating the unit measurements, and in all trials it was found most important to have control plots interspersed amongst the others to be used for determining the experimental error before the value of differences observed amongst the other plots could be estimated. Though there were some exceptions, on the whole the high yield in the nursery was correlated with high yield in the field, this was specially true when small blocks were taken as the nursery plots, the reason for this probably being that in that case the methods of growing were exactly similar; while, in the ordinary centgener the equaling of the plants might introduce a fresh factor, and in the case of the rows competition between adjacent rows might introduce another source of error.

Studies of Natural and Artificial Parthenogenesis in the Genus *Nicotiana*. — HELLINGTON, R. in *The American Naturalist*, Vol. XLVII, No. 557, pp. 279-303. New York, May 1913.

An attempt to produce parthenogenetic seed in the genus *Nicotiana* by means of the stimulus caused by foreign pollen, by mutilations, by radiation, or by infections. Several hundred trials were made, but no unquestionable case of seed production was obtained.

On the Behaviour of Wheat subjected to the Action of Copper Sulphate Solutions of Different Concentrations. — LESAGE, P. in *Bulletin de la Société Scientifique et Médicale de l'Ouest*, Vol. 21, No. 3, pp. 129-132. Rennes, 1912.

Wheat grains were steeped in solutions of copper sulphate varying in strength from 31 to 40 per cent. and for times varying from 1 to 195 hours. The vitality of the seeds was not seriously depressed in solutions of 10 per cent. so long as the grain was not left in the solution more than a few hours. But at the same time it was observed that moulds also developed in solutions up to 10 %, so that the effectiveness of copper sul-

phate dressings for seed grain, which are usually carried out with 1 to 2 cent. solutions, becomes very questionable. At the same time the writer points out that in drying the grain subsequently to the steeping, the solute left on the surface of the seeds may become sufficiently concentrated to be toxic to mould spores.

798 - **Wild Wheat in Palestine.** — COOK, O. F. — U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 274, 56 pp. Washington, April 1913.

Following on the discovery of a new wild wheat by M. Aaron Aaronson, director of the Jewish Agricultural Experiment Station at Haifa, Palestine, the writer was instructed in 1910 to make further investigations of the subject. The present bulletin includes an exhaustive study of the plant in its natural habitat and shows that normally it is a cross-fertilized species. It is widely distributed on the Anti-Lebanon range of mountains in northern Palestine and Syria, and is specially abundant on limestone formations. Its behaviour suggests the possibility of acclimatization in the south-western part of the United States, where it may be of value both for crossing purposes and as a fodder plant, and trials are being carried out to that effect.

799 - **Sudan Grass, A New Drought-Resistant Hay Plant.** — PETER, J. — U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 125, Washington, May 1913.

Seed of the grass *Andropogon halepensis* was imported into the United States from the Sudan in 1909, and has been tried in Texas and other parts of the semi-arid zone. The grass yields well in specially dry seasons and the fodder is much appreciated by stock. Large quantities of seed are now being grown and the crop promises to be a valuable acquisition to the land farmers.

800 - **Projected Revival of the Flax Industry in England.** — VARGAS BRYAN, in *Science Progress*, Vol. VII, No. 28, pp. 596-628. London, April 1913.

The cultivation of flax in England has always been subject to wide fluctuations, and though as late as 1870 23,957 acres were under crop, the area gradually declined, and has been quite insignificant since the markets being supplied by Russian fibre. Of late years, however, the linen industry in Russia has developed enormously, and it is now able to deal with all the best quality fibre produced in that country, so that the possibility of reintroducing flax as a remunerative crop in England has received the attention of the Commissioners appointed under the Development Act of 1909. At this end the writer was appointed in 1911 to gather first-hand information about the crop by studying its cultivation in Russia, Holland, Belgium, France, Ireland, Austria-Hungary and Germany. Moreover, certain experiments were conducted last year in Bedfordshire, where, by raising the crop, retting experiments were made in tanks specially constructed for the purpose.

A Report of the enquiry was made to the Commissioners, who gave their consent to the publication of the above article which summarizes the document.

The Report leaves no doubt that the climate and soils in many parts of England, notably in Yorkshire and Somerset, as well as in the Midland and Eastern counties, is well adapted to the production of high quality fibre, though its cultivation is somewhat more troublesome than that of any farm crops, no difficulty should be encountered in that connection if that practical information can be placed at the disposal of the farmers. In order to produce high quality fibre, the process of retting and scutching requires skilled labour which could not be supplied by any farm servants, and it seems advisable that it should be undertaken by specialists; the all important question is, then, whether the afterment of the crop can be dealt with in such a manner that remunerative prices can be offered to the farmers for growing the crop. The general opinion is undoubtedly favourable, but only practical trials can afford the knowledge, and recommendations for the establishment of one or two small retting depots, each capable of dealing with the produce of 50 acres, were made in the Report. The gain to British agriculture, should the experiment prove successful, is held as an ample justification for the expenses that would be incurred. The recommendations were favourably received by the Commissioners, and a society has been formed under strict conditions of non-profit trading in order that it may be eligible for a grant under the Development Act.

The Bedfordshire trials in 1912, alluded to above, were made to include a range of varieties of seed procured in Russia and in Holland and the effect of varying quantities of potash at the time of sowing. Though care was taken not to select exceptionally favourable soil, the crops generally were successful.

Some difficulty was experienced in getting the crop weeded and cut, but the villagers displayed some anxiety to do their best and their co-operation became more useful as they became more familiar with the work. The labour in the fields was abundant. Attempts made to construct a bed for purifying the effluent from the retting tanks, though not altogether successful, indicated that the method might eventually prove successful, and further trials will be carried on during the present season. It is hoped at the same time to conduct some more systematic experiments with a view to gaining experience for the subsequent establishment of a small retting station.

Cotton in Egypt and the Anglo-Egyptian Soudan. *Official Report International Federation of Master Cotton Spinners and Manufacturers' Associations*, pp. 1-347. Manchester, March 1913. — DUDGEON, G. C. in *Bulletin of the Imperial Institute*, vol. XI, No. 1, pp. 90-101. London, January-March 1913.

At the October meeting of the International Cotton Committee in London in 1911 it was decided to send Mr. Arno Schmidt, the Secretary of the International Federation of the Master Cotton Spinners' and Manufacturers' Associations, to Egypt to prepare an itinerary for a tour of investigation by members of the Federation; and, as a result, Mr. Arno Schmidt visited Egypt at the end of the year and wrote a very valuable report of his visit. In October 1912 the International Congress met in Egypt, where he had the opportunity of holding important discussions with various re-

representatives of cotton-growing interests in Egypt. The delegates more decided that Mr. Arno Schmidt should proceed to the Anglo-Egyptian Sudan and report on that country with a special view to its possibilities with regard to the production of cotton. The reports of Mr. Arno Schmidt on two journeys, together with that of the visit of the Congress, and an appendix containing original articles by various technical experts, a few official documents relating to the matter treated, and some useful cotton statistics, are published in the above volume and form a valuable contribution to our knowledge of the Egyptian cotton question at the present time.

The deterioration of the Egyptian cotton crop formed the basis of a number of the discussions. The decline in yield is a very real one and can be attributed to the fact that fresh lands are being used for the production of cotton which are less fertile than the older ones, for on old estate the decline is equally evident. The loss of quantity has been the subject of much complaint amongst spinners for some time past.

The causes for this deterioration are numerous. Amongst the most important may be mentioned the mixing of varieties: as cross-pollination is a very usual phenomenon in the cotton plant the introduction of a seed of an inferior grade very soon begins to affect the bulk and, together with the complete lack of appreciation of the necessity for any seed selection by the native cultivator, has undoubtedly had an important share in the reduction of both yield and quality. Another set of causes may be grouped together under the heading of bad cultivation and are chiefly due to the difficulty of educating the fellah. By long use, agricultural procedure has become a part of the people themselves, and even with altered circumstances the necessity of reforms or modifications is rarely recognised. For instance the difficulty of obtaining sufficient Nile water is such an established principle, that the possibility of using too much is hardly considered, and consequently the cotton fields suffer from overwatering. This, together with the practice of planting too closely and not caring properly for the spaces, stifles the crop and tends to its deterioration; moreover the close foliage thus obtained forms an admirable protection to the insect pests, the severity of whose periodical visitations has been a marked feature in the decade. The crop, too, now appears twice in the rotation of three years instead of once as formerly. Lastly, the raising of the level of the water in the canals, together with the absence of natural drainage, has been conclusively proved to cause waterlogging of the soil and asphyxiation of the plants.

With such a list of noxious influences the wonder appears to be not that the plant could exist at all than that the yield and quality had been reduced; but with a thorough appreciation of the gravity of the position, far-reaching remedial measures have been inaugurated, the effects of which will probably make themselves felt before long.

In the first place, a Botanical Laboratory and Plant Breeding Station has been established at Giza under the direction of Mr. W. L. Balls, in which much valuable research work has already been done, and with this as a source of new varieties specially adapted to the conditions of the country, the Government have undertaken their propagation and final distribution.

the seed to the farmers under the most favourable terms. For some time past the best and purest seed in the country has been obtainable in the State Domains, but only the larger farmers availed themselves of its supply. The Government is now taking up the distribution amongst smaller farmers and it is further suggested that the State should make sale of cotton seed a licensed trade in order to prevent altogether the use of inferior seed. The Government too has established a number of demonstration farms to educate the fellah in the matter of cultivation, these have been so successful that they are being repeated in all parts of the country.

With regard to the insect pests a Commission has recently been appointed to study the subject thoroughly. It is hoped that they may find means of checking the ravages of the pests by the introduction of an insect parasite of the cotton worm such as exists in India, where the cotton worm is a common insect but has never been observed as a pest on the cotton in Egypt.

The question of drainage too is occupying much attention; a great deal of work has been done for the relief of those areas in the Delta which suffer most has now been commenced by the Government but will take many years to complete. The chief difficulty lies in the low level of the land and the necessity of raising the water to higher levels by means of a pump in order to get rid of it. At the same time, now that the raising of the Assuan dam has produced the necessary water supply, the new drainage system will also make possible to reclaim large areas of salted land in the lower part of the Delta. In the Sudan, the cotton-growing districts may be considered under the following headings:

1. Flood Irrigation.

This includes the Tokar district where 50 000 feddans (1) are under cotton and the Kassala district where 4 000 feddans are under cotton. Both are watered by the flood water of the Khor Baraka and the Gash respectively. Both these rivers come from the mountains of Abyssinia and are in flood from July to September, at which period only they reach the sea. The water thus obtained, together with a rainfall of about 6 inches per annum, is sufficient to raise a cotton crop which yields about 400 lbs. of seed cotton per acre, but which can easily be raised to 600 lbs. of seed cotton with a little care. Cultivation is very primitive on account of the fact that the rivers have a habit of flowing in different districts from year to year does not encourage the cultivators to prepare their land in advance. Only the best quality cotton is grown by the natives and the Government also exerts a controlling influence on the Tokar market by having an official classifier for grading the crop. For a proper control of the flood water large areas of suitable land could be brought under cultivation, but railway communications must also be established before the districts can be developed.

(1) 1 acre = 0.936 feddan.

II. *Pump Irrigation.*

This is practised in the districts north of Khartoum where the climate is not particularly well adapted to cotton. Plantations are still almost in an experimental stage and the Zeidab estate of 10 000 feddans run by the Sudan Plantation Syndicate is the most flourishing example.

III. *The Ghezira.*

This district consists of the triangular piece of land between the Blue and the White Nile south of Khartoum. Here the rainfall gradually increases as we go south and the climate generally is more favourable to cotton than in the district north of Khartoum. A great irrigation project has been formulated by Sir William Garstin for establishing a barrage at Sennar on the Blue Nile and cutting a canal from there parallel to the Blue Nile to point about 40 miles south of Khartoum. This would eventually lead to the irrigation of 1 000 000 acres at an estimated cost of £6 000 000. In the meantime a test farm was started 2 years ago at Tayiba where about 2 000 acres are now irrigated by means of a pumping station. The management of the farm has been given to the Sudan Plantation Syndicate who had the experience of their other plantations to guide them and were able to induce trained farmers to come from Zeidab and teach by their example the inhabitants of the Ghezira the proper way of growing cotton. The experiment has been a complete success. Natives are clamouring to be allowed to become tenants and the cost of producing cotton is very little higher than in America. It would seem advisable before embarking on the main irrigation scheme to repeat these test farms in two or three other parts of the Ghezira in order to be quite certain that other soils are equally suitable and to ascertain through actual experience the cost of excavating the channels in the various parts of the Ghezira, and, at the same time, to educate the inhabitants in cotton growing and to await an increase in the population to take up the holdings.

IV. *Rain Grown Cotton.*

Suitable districts for this form of cultivation occur south of Sennar and the southern portion of the Kassala province. The methods of cultivation are very primitive and only American varieties flourish. So far about 1000 tons of this kind of cotton are produced annually but the possibilities of extension are said to be very great.

In conclusion it may be added that in the debate which followed the reading of the King's speech at the opening of the British Parliament in March 1913, the Right Hon. H. H. Asquith, Prime Minister, said: « I may say, as to the Sudan loan, that the maximum amount we propose to ask is £3 000 000 in instalments, and I believe that prospects of its development are such as to afford ample security. »

802 - **Egyptian Cotton Culture in the Southwest (United States).**—SCOTT, C. S. in U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 123, pp. 21-28. Washington, April 26, 1913.

Extensive trials of Egyptian cotton were made in irrigated districts of Arizona and California during the season 1912. Seed was distributed

runners and about 530 acres were planted. The yield per acre varied from 0 to 700 lbs. of lint, which fetched the same price as imported Egyptian cotton. The results in general appear to justify further trials on a still larger scale.

Ground-Nut in Gujerat. — SANE, C. V. in *The Agricultural Journal of India*, VIII, Part II, pp. 178-184. Calcutta, April 1913.

A short article showing that the cultivation of ground-nuts, after having been tried at the Government Farm, Surat, is slowly extending over Gujerat. The crop is liable to damage by birds, beasts and thieves, but the cost of cultivation and harvesting are very high; but good yields of 600 lbs. per acre are obtained, and the possibility of large profits induce cultivators to adopt it as a regular crop in their rotation.

The Nicotine Content of Hungarian Tobaccos. — TOTI, GYULA *Magyar Dohányfűszeg*, Year XXX, No. 9, 5 pp. Budapest, May 5, 1913.

This is a continuation of a series of experiments regarding the nicotine content of Hungarian tobaccos (1). The writer effected the complete extraction of nicotine from tobacco leaves destined exclusively for the Hungarian fac-

tories. Hungarian tobaccos are mostly not manufactured till two or three years after the leaves have been gathered. The writer has found that the nicotine content of the leaves diminishes during this time, a fact which is especially noticeable in the case of these tobaccos from the consumer's point of view, as the original amount of nicotine present is very large.

The writer examined first and third class tobaccos of the following varieties from the crops of 1907 and 1910: Debreczen, Tisza, Szeged, fine semi-fine garden, Muskátály and common tobacco. The samples were taken from nearly all the districts supplying the Tobacco Monopoly, the data obtained can be generalised.

Table I shows the nicotine content of the different varieties.

TABLE I.

Variety	No. of samples examined	Minimum %	Maximum %	Average Content %
Debreczen	24	1.8	4.5	3.0
Muskátály	25	1.7	5.3	3.1
Tisza	16	2.5	4.6	3.8
Fine semi-fine garden . . .	65	0.5	3.6	1.6
Szeged	13	1.4	6.2	3.7
Common	5	1.4	5.9	4.3

As to the diminution of the nicotine content during the keeping of tobacco, this was a mere hypothesis.

Table II gives the nicotine loss in 12 samples of tobacco analysed at different dates.

TABLE II.

Variety and Quality	Nicotine per cent.		
	at the beginning of the experiment	after 6 months	after one year
Szeged I	2.2	2.2	2.2
Tisza I	4.6	4.4	4.4
Tisza I	4.2	4.0	4.0
Muskatály I	4.4	4.1	3.7
Semi-fine garden I.	1.9	1.6	1.6
Debreczen I.	4.4	4.4	4.4
Muskatály III	2.2	2.2	2.1
Debreczen I.	4.2	3.9	3.9
Semi-fine garden III.	1.1	1.1	1.1
Muskatály	3.1	3.1	3.1
Semi-fine garden	1.6	1.5	1.5
Common III	1.4	1.4	1.4

These results show that tobacco kept for a long time in a dry place may lose a certain proportion of its nicotine content.

805 - **Economic Results of Cultivating Heavy Tobacco Crosses Resistant to *Thielavia basicola*.** — AIELLI DONNARUMMA in *Bollettino tecnico della coltivazione dei tabacchi pubblicato per cura del R. Istituto Sperimentale in Scafati (Salerno)*, Year XII, No. 2, p. 89 + figs. Scafati, March-April 1913.

A supplement to the observations published in No. 5 of the above-mentioned periodical for 1911 and No. 6 for 1912 (1). The economic results obtained in cultivating tobacco in the Province of Salerno are given in a table. While the Kentucky variety there only yields a gross return of about £2 per acre, the heavy crosses (Italia × Kentucky, Salento × Kentucky, Mo × Kentucky) yield a gross return of from £28 to £35 per acre. This result is the more important, seeing that this type of tobacco is also superior from an agricultural and an industrial point of view.

806 - **Observations on the Preparation of Cacao.** — PERROLI, E. in *Comptes rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 18, pp. 1394-1399 Paris, May 5, 1913.

The cacao which finds its way to the European markets from the countries where it is produced undergoes fermentation after being gathered. The conditions of this process are as yet undetermined, with the result that the cacao-making industry has to deal with an extremely variable product. The operation has the double aim of destroying the sweet muc-

(1) See No. 234, B. Jan. 1912, and No. 520, B. May 1913.

aginous pulp which adheres closely to the seeds of the fruit, and to produce useful chemical changes in the kernel.

In a first series of studies, undertaken with the object of making the preparation of cacao more systematic and less difficult, the writer found that the method at present in use could be modified with advantage by using a mechanical process for removing the pulp after a preliminary treatment of the fruit with a weak alkaline solution: The fresh seeds are macerated for some hours at a temperature of 45° to 50° C. in a 1 per cent. sodium carbonate solution and are then left in a warm, damp spot until the pulp has undergone sufficient transformation. Unfortunately, this process gives every opportunity for the growth of moulds, and for this reason the writer has undertaken new investigations with a view to sterilizing the fresh seeds.

By the simple action of steam under slight pressure in an autoclave, seeds were obtained which after the pulp had been removed mechanically presented an excellent appearance. The flesh of the kernel retains its beautiful violet colour after desiccation, showing that the tannic compounds had undergone no chemical change. The sterilized seeds were reduced to powder and then subjected to two kinds of tests, the one of a chemical, the other of a biological nature. From these it was concluded that it is possible to obtain changes in this sterilized powder in the laboratory which are comparable to those in the course of the present method of preparation practised in the countries where the cacao is grown and that the latter could derive considerable benefit from the adoption of the new process.

7 - **New Kitchen Garden Plants** (1). — DUBOIS P., in *La Vie Agricole et Rurale* Year 2, No. 23, pp. 671-673. Paris, May 10, 1913.

Very long Aubergine, Perfection. — Very hardy and early as well as unusually productive. Each plant (about 3 ft. in height) bears 15 to 20 fruits, 5 to 12 inches long and 2 to 3 inches in diameter; the fruits are nearly cylindrical, of a fine dark violet colour and travel well.

Improved white Cardoon. — This is distinct from other varieties on account of its very wide, thick, full, tender, fleshy ribs, which, so to say, whiten of their own accord; vigorous, hardy, and without spines.

Improved Saint Fiacre Carrot. — A good variety as regards fine flavour, shape and colour; it is the result of long continued selection of the ordinary Saint-Fiacre variety and belongs to the short, red, early type.

Cauliflower, Marvel of All Seasons. — This variety has a short stem and green foliage, is erect and regular and resembles the half-hard Paris variety. Its large heads, nearly covered by the leaves, are very white and fine, and close-grained in texture. Their quality is excellent and their development very rapid. The early growth of the head makes this variety suitable for forcing, while as it resists not only spring frosts but also excessive heat in summer it is equally adapted to planting in the open.

Early Cabbage, King of the Markets. — One of the earliest summer cab-

(1) See No. 374, B. April 1913.

(Ed.).

bages. The head is large, round and very firm, rising from amidst, fine glaucous, rounded foliage.

Improved Rochford Cucumber — The favourite variety in England. The foliage is abundant and the plant produces a quantity of fruit with firm flesh and of a delicate green, recalling by their shape the Improved Telegraph Cucumber, but with more prominent spines.

Green Water-Melon from Tripoli (non-running). — This variety, which is very common in Egypt, has straight, elongated, well-shaped fruits, which when completely developed are of a uniform dark green. The plant is vigorous and very prolific, has divided leaves, and is resistant to heat.

Extra-early dwarf "Mangetout" Haricot with green seed. — This variety presents the same advantages as the extra-early dwarf white Mangetout but in addition, produces a green seed like that of the green kidney bean, if properly dried in the shade before being completely ripe.

Red winter G. N. Lettuce. — These lettuces, though small, produce heads of a nice shade of green tinged with copper colour, and are crisp with an excellent flavour. They pack and travel well.

Marteau Turnip for forcing. — Very early, has little foliage and grows rapidly, being thus especially adapted for first sowings under glass, as an early vegetable, or for late sowings. The shapely clean very white root resembles in shape the Marteau form of the Des Vertus turnip. Its flesh is fine and sweet.

Colossal Virgin Sorrel. — Has remarkably large leaves, still larger than those of the Blonde Lyons.

Express Mangetout Pea. — A half-tall variety (3 ft. 6 in.) producing abundance of fine large pods; very early.

Mammoth wrinkled dwarf Pea. — Early, coming in immediately after the very early varieties; produces a large number of pods.

Wrinkled tall pea, Sensation. — The result of a cross between Alderman and Edwin Beckett. This new hybrid resembles both its parents in habit, and like the first is remarkable for its resistance to heat and for its productivity. The strong, solid stems are provided with ample foliage, and attain a height of about 5 ½ feet. They are covered with pods, usually in pairs 6 to 7 inches long, very full and containing 11 or 12 large green sweet melting peas of excellent flavour, which remain tender even if picked when almost ripe. A mid-season variety.

Oval white summer Radish. — The root is smooth, very clean, and well shaped; the flesh is fine, and very full and has an excellent flavour; as the roots do not become hollow early, they need not be eaten till they are nearly full grown. This variety does not split, even in very wet weather.

Dwarf extra-curved parsley, Perfection. — The leaves are very fine and curly.

98 - **A Comparison Between the Cuttings of Grafted and Ungrafted Vines** (1).

— BACO, F. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 136, No. 15, pp. 1167-1169, Paris, April 14, 1913.

The writer has shown in a preceding paper that "Grafting does not preserve absolutely the characters of the associated vines forming respectively the stock and the scion.

"There are cases where modifications of these characters are observed in the reciprocal transmission of certain other characters, which are regarded by writers on vine-growing as primordial or definitely acquired. Any particular character possessed by a hybrid can be accentuated or diminished, that is to say systematically modified, by grafting on suitable stocks (2)".

In continuing his investigations, M. Baco proposed to discover whether variations thus obtained persist, or increase, in propagation by slips, and whether they are accompanied by changes in the root system.

On February 10, 1911, ten slips as similar as possible were taken from each of eight types mentioned later (two controls and six subjects of experiment); variations in these vines had been observed in the writer's experiment field at Bélus (Landes).

The vines were planted separately in good, friable, homogeneous soil and at the same depth; they were left for 2 years without other care than hoeing, and the spraying necessary for keeping them in good health; all the vines were treated alike. The writer determined, chiefly in 1912, and in particular on August 28 and October 20 of that year, that the characters acquired by means of grafting had persisted; in particular, those of colour, habit, vigour, leaf-fall, and resistance to mildew. On up-rooting the vines on January 28, 1913, M. Baco further found that the parts below ground had undergone changes in accordance with those of the parts above ground.

Plants derived from grafts showed the following differences from those taken from ungrafted vines:

Ungrafted Baroque. — Roots going deep (35°), fleshy, with rootlets.

Baroque from graft on 1202. — Roots going somewhat deep (55°), fleshy and fairly rich in rootlets.

1202 from graft on Baroque. — Roots spreading (70°), very fleshy, with rootlets.

1202 from plant on its own roots. — Root going somewhat deep (54°), very fleshy, and rich in rootlets.

Baroque from graft on 157¹¹. — Roots somewhat spreading (60°), fleshy, and with many rootlets.

Baroque from graft on Rupestris du Lot. — Roots going somewhat deep (50°), very fleshy and very plentifully supplied with rootlets.

Baroque from graft on 3309. — Roots somewhat spreading (65°), fleshy, very rich in rootlets.

Baroque from graft on 101¹⁴. — Roots going somewhat deep (55°), somewhat fleshy, and with many rootlets.

From these experiments "it may be concluded that, in the cases of the grafted Baroque and grafted 1202 at Bélus, as well as in those of this Vinifera

(1) See No. 138, B., Feb. 1913.

(Ed.).

(2) F. BACO, *Sur des variations de vignes greffées*. — *Comptes Rendus*, Feb. 15, 1909.

fera grafted on 157¹¹, Rupestris du Lot 3309, and for 14, certain specific variations due to grafting have proved to be transmitted by slips, and the modifications of the parts of the plant above ground have been accompanied by important specific changes in the root system."

809 - **Late Pruning.** — RAVAZ, L., in *Le Progrès Agricole & Viticole*, Year 30, No. 1 pp. 517-518. Montpellier, April 27, 1913.

The following table gives the results obtained in 1912 at the Montpellier School on a plot of vines devoted to the determination of the influence of the pruning time upon vegetative phenomena.

No. of Row	Destroyed eyes %
9 Pruned in September, after the vintage	37.70
10 Pruned on the fall of the leaves	74.00
11 Pruned the end of December	61.00
12 Pruned when the sap began to rise	31.50
13 Pruned at the opening of the buds	4.80
14 Pruned when the shoots were 5-6 cm. long	0.00

The following tables give the wood and fruit production.

		Weight of wood per vine in ounces								
		1905	1906	1907	1908	1909	1910	1911	1912	Average
Row	9	11.5	18.0	22.0	14.0	14.4	16.8	21.2 *	23.9	17.7
"	10	11.7	21.2	21.6	19.6	26.2	29.0	28.9	28.6	23.4
"	11	11.1	16.3	23.2	16.6	20.3	23.5	21.2	23.7	19.5
"	12	13.7	16.7	19.4	16.5	18.4	24.1	21.1	22.6	18.7
"	13	13.8	18.9	18.9	15.9	21.2	23.4	19.1	23.4	18.8
"	14	14.8	17.4	17.8	19.7	23.1	21.2	21.4	26.9	20.0

Thus, the latest pruned row always takes a good place.

		Number of bunches per vine					
		1908	1909	1910	1911	1912	Average
Row	9	12.15	17.2	16.7	15.3	12	13.7 ²
"	10	12.45	14.6	18.8	18.1	15	14.44
"	11	14.85	18.6	16.7	17.4	13	15.3 ⁰
"	12	14.55	19.8	19.7	20.0	12	17.2 ²
"	13	18.30	20.5	19.4	19.6	14	18.54
"	14	14.55	17.7	18.1	26.1	19	19.60

	Production per vine in ounces							
	1906	1907	1908	1909	1910	1911	1912	Average
9. . . .	47.0	149.9	143.3	92.1	96.0	64.7	38.2	90.1
10. . . .	27.8	145.0	125.6	152.8	143.0	80.3	78.8	107.6
11. . . .	36.2	120.3	109.2	107.8	124.5	67.8	55.5	88.8
12. . . .	44.5	134.4	141.1	134.4	136.9	40.8	82.3	107.3
13. . . .	40.3	168.0	141.1	120.7	131.8	83.5	74.2	108.8
14. . . .	55.7	157.7	147.7	125.4	123.4	102.8	62.2	110.7

In order to make the data complete, the production per vine is given, the figures for 1912 are of no value, as all the rows were tested by an artificially caused attack of mildew.

— **Planting Northern Vineyards and Forcing-Houses with the Assistance of American Stocks.** — PROSPER, GERVAIN in *Le Progrès agricole et viticole*, Year 30, No. 21, pp. 648-657. Montpellier, May 25, 1913.

Phylloxera still continues its devastating course, for though its progress has been somewhat checked in the Northern and North-Eastern districts, where the climate is cold and damp, this does not prevent the systematic destruction, and the undoubted disappearance of old vineyards. And then there will arise in those districts, if it has not already arisen, the question of whether it is well to replant the vanished vineyards, of the conditions under which this could be done, together with the means and methods to be adopted to carry out the work.

The writer considers that the reconstitution of northern vineyards is wonderfully simplified by the use of American stocks or their hybrids, in account of the undoubted advantages accruing from grafting, *viz.* early maturity, and increased yields of better-developed and improved fruit.

The satisfactory results of grafting should be seconded and completed by the choice of the grafts. These should be carefully selected and have reached the first stage of maturity. It would be well further to choose only white varieties.

The stocks which seem most suitable to the soils and climates in question are: the Berlandieri hybrids (Vinifera-Berlandieri, Berlandieri \times Riparia); the Riparia hybrids (Solonis \times Riparia, Riparia \times Rupestris); the hybrids of Cordifolia (Cordifolia \times Riparia, Riparia \times Cordifolia-Rupestris, Solonis \times Cordifolia-Rupestris,); these are preferable to Rupestris and to hybrids of Vinifera \times Rupestris, whose well-known faults should prevent their being used.

The building of forcing-houses and the cultivation under glass of American stocks, or hybrids, will open up new resources, and bring the

vine-growing industry the elements of true progress, of development and of continued prosperity.

811 - **Horticultural Research: the Action of Grass on Trees.** — PICKERING, S. *Science Progress*, Vol. VII, No. 28, pp. 490-503. London, April 1913.

The harmful influence of grass on fruit trees varies considerably with the nature of the soil and the method of treatment. Young trees planted in land already grassed or put down to grass immediately after planting suffer most, while if grass is merely allowed to establish itself slowly in an older plantation the effect seems to be reduced to a minimum. But the action is a perfectly general one, and with one single exception has been observed in all parts of England and in all classes of soil. The visible effect is not confined to stunted development, but is manifest too in the altered colour of bark, leaves and fruit.

Numerous possible causes of these changes have been investigated, foremost among which are lack of water and plant food owing to the competition of the grass. Trees under grass were watered by means of tubs so that the soil in contact with their roots was moister than the adjacent tilled soil, and observations taken one season showed that the moisture content in soil under grass was never reduced below the optimum point, yet in both cases the trees were obviously less healthy than similar trees in tilled soil. In other experiments carried out in pots the grass roots were prevented from coming in contact with the tree roots by a sheet of fine gauze placed about 4 inches below the surface, and plant food was supplied from below, yet even under these conditions the trees suffered from the grassing. Added to this, the general conclusion is that trees in tilled soil do better in dry years than trees in grassed soil, and wet ones, also that soil under grass is usually richer than tilled soil, disposing of the water and food supply as possible causes. Feeding the grass with sheep does not improve matters, and the effect of keeping poultry in grass orchards is now being investigated. Mechanical analyses of the soils failed to reveal any contributing cause, nor was the effect simulated when the soil was made alkaline. Lack of aeration would not appear to be of importance from a consideration of the iron drum experiments described in the previous article (1) and of the fact that trees were grown in a soil artificially enriched with carbon dioxide without disturbance, and it is equally impossible to make differences in temperature between grassed and tilled soils account for the phenomenon. Finally, bearing in mind all the available evidence, the writer was led to the conclusion that the action must be due to some *toxic effect*, using the term in its wider sense to mean the presence of some poisonous substance in the soil, without defining its direct source; this hypothesis is certainly confirmed by the following experiment: trees were planted in pots, the surface of which was covered by movable perforated trays on which the grass was grown. In spite of the complete

(1) See No. 378, B. April 1913.

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eration of the grass from the tree roots, the growth was reduced by 25 per cent; when, however, the drainage from the grass was collected and left exposed to the air some time previously to being used on the tree, the effect was beneficial. These results indicate that the trees suffer by reason of nothing added to rather than removed from the soil, also that by aeration the toxin is converted into plant food.

Now when a soil is heated, the amount of soluble organic matter it contains is increased, and at the same time the soil becomes toxic to germinating seed. Both these effects are considerable at 150° C., but diminish with temperature; they are still recognisable at 60° C. and probably begin to operate at 30° C. A similar effect is obtained when a soil is treated with antiseptics, and the toxic substance decomposes gradually if the soil is aerated and moistened, but remains unaltered for several months if air is excluded from the soil; the rapidity with which the toxin is formed indicates that it is a direct and unstable product of chemical reaction. The soluble organic matter decreases with time, but not as rapidly as the toxin, so that when the toxin has completely disappeared some excess of the soluble organic matter is left over and accounts for the increased fertility of the treated soils. Potato and tobacco plants grown in soil heated to 30°, 60°, 80°, 100°, 125°, and 150° C. respectively clearly showed the effect of these two opposing forces; after a preliminary check the plants grown in the soils heated to lower temperatures recovered and were able to profit by the increased oxygen supply, but when the soil had been heated beyond a certain point, the check was too prolonged and the plants never caught up lost time, so that a second crop was required to show the effect of the increased nitrogen supply. The results varied a little according to the sensitiveness of the plants, but on the whole the results justify the conclusion that the oxidisable organic substance which is toxic to seeds is also toxic to plant growth. In order to extend the experiments to trees, the aeration of the soils was effected by enclosing them in bottles, and under these conditions the toxic effect of those heated to 125° and 150° C. became noticeable.

Coming back to the question of grassing, a somewhat analogous case is presented when soil is first uncovered by the removal of grass; it does not behave normally at once, but after exposure to the air becomes more favourable to plant growth than ungrassed soil, owing to the presence of a larger amount of nitrogenous and organic matter. The resemblance between the behaviour of grassed and heated soils is shown in yet another manner: owing to the presence of some oily or waxy substance heated soils are more difficult to wet than unheated soils, and this peculiarity is reproduced to a lesser degree in grassed soils. On the other hand grassed soils have never proved toxic to germinating seeds, so that the connection between the two cases is not established, though they undoubtedly have some points in common.

The writer is unable to accept Russell and Hutchinson's hypothesis of protozoa as the limiting factor in soil fertility, for on this hypothesis a maximum fertility should be obtained by heating soils to 50° C., at which temperature protozoa are killed with least injury to bacteria. He points

out that his experiments do not confirm this view; but, he adds, on the other hand if the process is a purely chemical one resulting in the formation of toxin it seems difficult to believe that the plant food liberated by heating soil to 100° C. would be sufficient to account for the extra vigour of plants. He concludes by saying that "both explanations are probably correct but neither alone affords a full explanation of the facts".

812 - **The Plum Industry in Servia.** — SROYKOWITZ, W. in *La Vie Agricole et Rurale*, Year 2, No. 21, pp. 616-619. Paris, April 26, 1913.

The importance of plum cultivation. — Plum growing and the various industries connected with it form a very important source of the revenue of Servia. Plums, under different forms, are exported annually to the value of nearly a million sterling.

Plums occupy a much larger area in the country than any other fruit trees, and are especially grown in the West and Centre of Servia, particularly in the departments of Kraguyévatz, Valyévo, Podrinje, Rudnik, Chachak, Ujitzé and Kruzhévatz. The following figures give an idea of the importance and the development of plum cultivation in Servia:

Year	Area under plums acres
1889	157 750
1900	251 000
1906	326 500
1911	346 500

By far the most widely grown variety is Projegatcha (Lorra plum). The trees are usually propagated by means of suckers taken from below the trees in old orchards; after planting they are left to themselves but there is a marked tendency towards more systematic cultivation.

The prosperity of plum growing is entirely due to the plum industry in Servia. About two-fifths of the total crop is dried, one-fifth is made into preserve, while the remaining two-fifths are used for the manufacture of plum brandy ("rakia" or "shlivovitz"), with the exception of a very small quantity exported as fresh fruit, chiefly to Germany; these are the finest fruits hand-picked before they are quite ripe. The home consumption also is included in the last-mentioned two-fifths.

The prune industry. — This industry is much developed and is very prosperous, Servian prunes being celebrated abroad. The somewhat primitive drying apparatus, the "puchmitza" (a kind of baker's oven and Glavinitch's oven, hitherto employed, are about to be replaced by very much better apparatus which has been selected from the exhibits many oven competitions organized by the Government.

The principal plum markets are held daily (except Sunday) from the 1st of September (old style) to the end of November, in the following towns: Belgrade, Shabat, Kraguyévatz, Valyévo, Chachak, Obrenovatz, Aranđelovatz and Loznitz. The Servian Government takes special measures throughout the plum season to prevent the sale of damaged or inferior fruit.

to prevent fraud. The prunes are sold by weight and also according to the number per pound. They are sorted in the salesmen's store rooms by means of sorters with sieves of different dimensions. The classification of prunes adopted in the Servian trade is, in general, as follows :

60-65	fruits per pound	" Chestizé "
70-75	" " "	" Sedmitzé "
80-85	" " "	" Osmitzé "
95-100	" " "	" Stotinké "
115-120	" " "	" Usance "
120-130	" " "	" Mercantil "

The exported prunes are dispatched in sacks containing 130 to 180 lbs. in boxes of 26 to 55 lbs. In the latter case, the prunes are placed in the box after packing, as in the common French method. Prunes are chiefly exported to Austria, Germany, Belgium, Holland, Denmark, England, Switzerland and Russia. They form an important article of commerce: exports amounted to between 40 000 and 50 000 tons from 1904 to 1908, then fell to 9 000 in 1909, and were respectively 23 500 and 32 750 tons in 1910 and 1911; the highest value in the ten years 1902 to 1911 was in 1911, viz. £654 500; it was nearly the same in 1907, and over £400 000 also in 1906, 1908 and 1910.

The manufacture of plum preserve. — This jam is made of completely ripe plums, without the addition of sugar. The fruit is first cooked, in order that the skins and stones may be more easily removed, and is then placed in special cauldrons 7 to 10 ft. wide and 24 to 28 in. deep. The cauldrons are heated over an open fire, as better results are obtained by this means than by steaming (as at Kraguyévatz). The prepared jam is placed in receptacles holding 12 to 15 gallons and exported abroad, chiefly to Austria and Germany. The exports averaged 13 000 tons from 1902 to 1908, then fell to 1 500 in 1909 and were 9 300 and 5 100 in 1910 and 1911 respectively; the greatest value in the 10-year period was in 1907 (£170 000), and in 1910 and 1911 it was £112 800 and £8 600 respectively.

The most important markets for plum jam are: Kraguyévatz, Chachak and Shabatz.

The manufacture of plum brandy. — Only fruit of inferior quality is used and that in very primitive apparatus; two kinds of brandy are made, one called "meká shlivovitza" (or mild) scaling 20° to 30°, and another called "outa shlivovitza" (strong) or "prépetchénitza" (redistilled brandy) scaling 40° to 50°. Only the latter is exported abroad.

The exports of plum brandy (including a little pomace brandy) varied between 600 000 and 800 000 lbs. from 1903 to 1909, and in 1910 and 1911 were respectively 200 000 lbs. and 57 500 lbs.; their value reached over £600 000 in 1905, but was only £630 in 1911.

merican civil war. The following account, which gives the yield of 8 seasons in 1869, shows the economic aspect of the industry:

Turpentine.	262 347 lbs.
Colophony	282 807 "
Tar	476 035 "
Total	1 241 189 "

Referring this total production to the 45 921 trees utilized yearly, the yield per tree is 3.377 lb., the net returns per tree being 0.57 d.

Considering the consequence of the extraction of resin from a cultural point of view the following chief drawbacks have been observed.

1. The failure of the wounds to heal when tapping without killing the tree is practised (*gemmage à vie*).
2. Difficulty of extracting resin by tapping to death, and injury to the wood.
3. Difficulty of combining the extraction of resin with selection felling, which is the best for Corsican pine.

The tapping of Corsican pine being abandoned, the extraction of resin from the maritime pine began in 1900. Several concessions for felling combined with tapping to death and tapping without killing the trees were granted by the State and by the Communes. In 1912 the total production of raw resin in Corsica was 54 045 gallons. Among the producers of resin the "Térébenthine française" Company deserves to be mentioned.

The management by selection felling has to be harmonized with the industrial tapping of maritime pine for resin. The writer believes the problem might be solved by a selection system "en damier," that is dividing the forest into regular stands of graduated age, but in no fixed order, each of which would be successively submitted to thinning, preparatory seeding, felling and final cutting.

In conclusion, the extraction of resin from the maritime pine may be considered as established in Corsica, but in order that the tapping over the whole of the 72 576 acres under maritime pine should be as satisfactory as it is conducted by the French Water and Forest Service, the three following essential conditions must be borne in mind:

- I. Labour must be introduced from abroad.
- II. The means of communication must be good so as to render the tapping profitable.
- III. The tapping installations must be sufficiently near each other and conveniently grouped, for the same reason.

LIVE STOCK AND BREEDING.

- 815 - **The Action of Arsenical Dips in Protecting Cattle from Infestation by Ticks.** GRAYBILL, H. W. — U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 167, 27 pp. Washington, April 15, 1913.

In this bulletin, the writer discusses the factors entering into the efficacy of dips used against the ticks which infest cattle. Dips act both in a destructive way and in a protective manner. The protective result may be in the nature of a destructive or a repellent action. The influence of dips on oviposition and the viability of the eggs is a factor in efficacy.

Mr. Graybill's investigations were directed to ascertaining the manner in which dips act on ticks, and in the introduction he gives the different components of arsenical dips and discusses the probable effect of each. His experiments proved conclusively that the protective action of arsenic is due to the larvae being killed and not to their being repelled. This prophylactic action is, however, of short duration; it is very noticeable for two days but ceases after five.

The cases of arsenical poisoning which occurred in one experiment were probably due to the presence of undissolved arsenic in the dip.

- 816 - **The Reciprocal Relationship between Husk in Sheep and in Deer.** RICHTERS, E. in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 11, Part 5, pp. 251-269. Berlin, May 5, 1913.

The writer investigated which species of strongylus are found in the lungs of sheep and of deer and how the relative embryos and sexually mature parasites differed from each other. The strongyli found in sheep were *Strongylus filaria* Rud. (*Dictyocaulus filaria*) and *Strongylus commutatus* (*Synthesocaulus commutatus*). The number of the former averaged 95 per cent., that of the latter 5 per cent. In many hundreds of lungs examined by the writer no other species were found. The sexually mature worms occurred either in the tracheae or in the bronchi, never in lung tissue. The male of *Strongylus filaria* Rud. has an average length 30 to 55 mm. and a breadth of 0.4 to 0.5 mm., with a long lobed pouch bursa; its posterior appendices are three-branched, the others are double. The speculæ have membranaceous wings. The females are 45 to 90 mm. in length and 0.4 to 0.6 in width; the posterior extremity is pointed, the uterus symmetrically situated in both halves of the body; the eggs containing developed embryos are of a longish oval shape provided with hyaline shell, 129 to 138 μ , long and 74 to 85 μ broad. The embryos have a dome-shaped enlargement at the anterior extremity, the tail is short; length of the embryos from 267 to 360 μ , width 14.8 to 18.5 μ . Both males and females possess an oesophagus with bell-shaped endomorph; the mouth is naked and the skin is ribbed longitudinally.

As for *Strongylus commutatus*, the writer states it to be a species by itself. Contrary to hitherto accepted opinions, however, *Strongylus capillaris* (*Synthesocaulus capillaris*) and *Strongylus rufescens* (*Synthesocaulus rufescens*) which have been found in sheep, appear to be identical.

The lungworms found in deer are exclusively *Strongylus micrurus* Mehlis (*Dictyocaulus viviparus*). Neither *Strongylus filaria* Rud. nor *Strongylus agilis* or any other species has been found in the hundred cases investigated. The writer describes *Strongylus micrurus* Mehlis as follows: Skin without longitudinal ribbing, mouth with chitin ring, oesophagus long and slender. Length: male 35 to 32 mm., female 40 to 77 mm.; breadth 0.4 to 0.6 mm. The male has a small closed bursa. The posterior appendices are three-branched, the anterior ones double and the middle ones simple. The ends of all the appendices are clubshaped, and the spiculae have no membrane wings. The heads of the embryos in the uterus are without hood; the embryos living free in the bronchial mucus are provided with a dorsal appendix and pointed end. The length of the embryos is 240 to 300 μ , their breadth 15 to 19 μ .

It thus appears from the researches of the writer that the lungworms of the sheep are distinctly different from those of the deer. He considers transmission of strongylosis from sheep to deer as unlikely.

— **Investigations on the Toxin of Ascarids.** — WEINBERG, U. and JULIEN, A. in *Hygiène de la Viande et du Lait*, Year 7, No. 5, pp. 225-244. Paris, May 10, 1913.

After careful investigations of the perienteric secretion of the ascarids, *scrostromae* and *taenia* found in the intestine of the horse, the authors have come to the following conclusions:

1. — That the perienteric secretion of *Ascaris megalocephala* acts injuriously not only upon animals submitted to experiment in the laboratory, but also upon horses. The above ascarids' secretion contains a toxin.
2. — If this secretion be dropped into the eyes of a horse, the secretion causes, in two thirds of the cases, a local reaction: swelling of the eyelids, inflammation of the conjunctiva, and running of the eyes.
3. — In severe cases the local reaction is accompanied by dyspnoea, diarrhoea and perspiration.
4. — In the course of 12 to 24 hours the inflammation of the eyes disappears; generally its intensity diminishes 2 to 3 hours after the introduction of the liquid into the eye.
5. — The effect of the toxin is various. Some worms have strong effects and others weak ones; in all cases their presence can be proved even in dilutions of 1 : 5000 by their action on the eyes of horses.
6. — The perienteric secretion owes its virulence not to one substance but to several; according to Flury's investigations its poisonous nature is due to aldehydes, fatty acids and their esters.
7. — The toxin is very resistant to heat; it passes through Chamberland filters and dissolves partially in alcohol and ether. Its volatile components are also toxins.
8. — The blood of horses affected by ascarids contains antitoxins which neutralize weak solutions of ascarid toxin. If the secretion be dropped into the eyes of such horses generally no reaction takes place.
9. — Among the other parasites found in the intestines of horses only *scrostromae* produce a poisonous secretion; dropped into the eyes of horses this produces only a slight inflammation.

- 818 - *Nuttallia* and *Piroplasma* causing Piroplasmosis of Equidae in Transcaucasia. — DACHUNKOWSKY, R. and LÖW, T. (Cattle Pest Serum Station, St. nobat) in *Parasitology*, Vol. 5, No. 4, pp. 289-306. Cambridge, January 1913.

The writers give in this paper a description of all the cases of piroplasmosis which they have observed in the Equidae, and establish in agreement with the most recent opinions on the subject, the presence of several kinds of piroplasmosis in Transcaucasia. The article is accompanied by two plates, which give different stages of the parasites: *Nuttallia equi* (Laveran.), *Piroplasma caballi* (Nuttall.) the mule *Nuttallia* and *Nuttallia asini* (Dachunkowsky & Luhs); a bibliography of 37 works is appended.

- 819 - *Salvarsan in the Treatment of Surra in Horses, Dogs and Rabbits.* — HOLMES, J. D. E. in *Memoirs of the Department of Agriculture in India, Veterinary Series*, Vol. 1, No. 2, pp. 88-148. Calcutta, January 1913.

These investigations were carried out at the Pusa Experiment Station. The memoir consists of three parts, which deal with the treatment of surra in horses, rabbits and dogs respectively. In each case mention is made of previous experiments made with arsenious oxide, atoxyl, soamin, arsacetin, orpiment and potassium antimony tartrate. The results of intravenous, subcutaneous and intramuscular injections of salvarsan in various amounts are described. They brought about a disappearance of the trypanosomes for long periods, but the treatment with salvarsan is not to be recommended in the case of horses or dogs.

- 820 - *Persistence of the Virus of Hydrophobia in the Ground and exposed to the Air, and Resistance to Cold.* — KONRADT in *Zentralblatt für Bakteriologie und Infektions-Krankheiten*, Vol. 68, Part 5-6, pp. 483-493. Jena, April 16, 1913.

The writer placed some rabbits which had died of rabies in different temperatures and at different depths in the ground, as well as on the surface and in places where they would decompose naturally, and after some time had elapsed made inoculations with the spinal marrow of these animals. The results were as follows: The virus remains active in dry, black, loam soil at a depth of 3 ft. for five weeks, on the surface between $+20^{\circ}\text{C}$. and $+16^{\circ}\text{C}$. for three months, between $+16^{\circ}\text{C}$. and $+25^{\circ}\text{C}$. for 67 days, between $+7^{\circ}\text{C}$. and -17°C . for 78 days and between 0°C . and $+8^{\circ}\text{C}$. for two months. Decomposition of the rabbits seemed to weaken the power of the virus.

- 821 - *Tuberculous Poultry the Cause of Tuberculosis in Pigs.* — BANG, OLUF in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 5, pp. 215-223. Berlin, May 5, 1913.

The writer deals with some special cases of spontaneous tuberculosis in pigs, which occurred in the last few years on Danish farms and were investigated by him. Dissection always revealed local tuberculosis of the gland of the digestive tract (tubercles the size of a hempseed in the spleen, liver, etc.) which however had no injurious effect upon the health of the animals. Fowls fed upon, or inoculated with, the substance of these glands, regularly developed tuberculosis, but guinea-pigs treated remained immune. Young pigs on being fed on the flesh of tuberculous fowls, immediately became themselves

selves affected by the disease. The writer considers that, in the above mentioned cases, the tuberculosis was due to the presence of the bacilli of avian tuberculosis, and believes, from the results of experiments, that by inoculating a living pig with fowl tuberculin it can be determined whether the animal is suffering from the avian or mammalian form of the disease. The writer attributes about 10 per cent. of the cases of tuberculosis in Denmark to the agency of the bacilli of the avian type.

- 12 - **Avian Tuberculosis.** — HASTINGS, E. G. and HALPIN, J. G. in *The University of Wisconsin Agricultural Experiment Station, Bulletin No. 28*, pp. 249-271. Madison, March 1913.

Avian tuberculosis has been prevalent in Europe for many years, but is usually been considered a relatively rare disease in America.

Since 1906 though a considerable number of avian tissues showing the presence of tuberculosis have been sent to the Wisconsin Station. After touching briefly upon the distribution of the disease and mentioning the bibliography on the subject, the writers deal with its characteristics, the way in which birds are infected, the spread of tuberculosis amongst hens and its transmission from flock to flock. The writers give an account of their studies of the avian tubercle bacillus, of their experiments in the infection of other animals, and of their researches concerning the relation of this disease to swine tuberculosis. They also discuss the identity of avian and mammalian tubercle bacilli and the significance of avian tuberculosis in connection with the hygiene of man.

- 23 - **The Anatomy of *Argas persicus*.** ROBINSON, L. E., and DAVIDSON, I. in *Parasitology*, Vol. 6, No. 1, pp. 20-45 + figs. Cambridge, April 17, 1913.

The writers treat of the subject with much detail and the text is elucidated by numerous good illustrations.

- 24 - **Researches into the Amount of Manganese Present in the Bodies of Animals.** — BERTRAND and MEDIGRECRANTU in *Annales de l'Institut Pasteur*, Vol. 27, Year 27, No. 4, pp. 282-288. Paris, April 25, 1913.

The writers made a chemical examination of 40 animals of different species, and were in every case able to isolate manganese, though the amount present was much less than in the case of plants. Among vertebrates, the mammals had the least manganese (only a few hundredths of a mg. per 100 of live weight). Birds, fish, frogs and reptiles had from five to ten times as much. Molluscs, which are the richest invertebrates in manganese, contain few mg. per 100 gr.

- 5 - **The Effect of Intestinal Poisons (Paracresol and Indol) on the Central Nervous Systems of Animals.** — WLADYCKO, S. in *Annales de l'Institut Pasteur*, Year 27, Vol. 27, No. 4, pp. 336-340. Paris, April 25, 1913.

Owing to a suggestion made by Prof. Metchnikoff, the writer attempted to ascertain the effect of paracresol and indol upon the central nervous system of animals. Every other day for 7 days first 1 cc., and later, 2 cc. of 2 per cent. paracresol were introduced into the stomachs of 10 rabbits and 18 guinea-pigs. At the same time, 12 rabbits received first 1 cc. and afterwards 2 cc. of 2 per cent. indol (in olive oil) every other day for 63

days, also introduced into their stomachs. At the end of the experiment the surviving animals were killed, the nervous system was carefully examined and compared with that of control animals. The results were as follows: All the rabbits which had been treated with paracresol and with indol showed a certain degeneration of the blood vessels of the brain and injury to the nervous plexus of that organ, though sometimes the effects were not well defined and the injury to the plexus was in proportion to the degeneration of the blood vessels. In the spinal marrow, the blood vessels were only affected in $\frac{1}{3}$ of the rabbits examined. Paracresol appears to have had no injurious effect upon the central nervous system of the guinea-pigs.

826 - **The Employment of Whole Milk and of Corrected Skimmed Milk in the Rearing of Calves and Pigs.** — (From the Zootechnic Institute of the Royal Veterinary College of Budapest). WELLMANN, OSCAR in *Kiserletési Közlemények*, Vol. XVI Part. 2, pp. 118-240 + 27 tables. Budapest, March-April 1913.

The writer, who is Professor of zootechnics at the Veterinary College has made a series of 22 experiments lasting 213 days on a calf and 9 young pigs fed on whole milk and corrected skimmed milk. He investigated the digestibility of these substances, their transformation into albumen, and their value as sources of energy.

The correction of the skimmed milk was effected by the addition of wheat and rye flour, or else of flour starch sweetened with "diastarine". Homogenized milk, in which a preparation of beef suet called "first gravy" was used as substitute for fatty matters, was also fed. Not having a respiratory chamber the writer controlled the fat and meat production of the animals resulting from the transformation of albumen and of energy by analysing the flesh of the animals slaughtered at the end of the experiments. But as this method proved incomplete, two control animals, belonging to the same litter as the subjects of the experiment, were killed at the beginning of the experiments and their organs analysed; the same was done to three of the experiment animals after the experiment.

The summary of the results obtained was as follows:

Skimmed milk to which sweetened flour starch had been added produced scouring, and even catarrh, after being fed for some time to the calf. In the case of the young pigs, on the contrary, this milk had a favourable effect in that it perceptibly increased the appetite of the animals. Homogenized milk was taken readily by the pigs, though sometimes it caused scour. This trouble was however, easily overcome by the addition of a small amount of citric acid solution. The young pigs digested the corrected skimmed milk very well, as well indeed as the sweetened starch. They consumed daily (when from 4 to 14 weeks old) with the milk, which they were fed *ad lib.*, over 1000 lbs. live weight, 30 to 47 lbs. of dry matter, 7 to 12.5 lbs. of digestible protein, 0.7 to 12.4 lbs. of digestible fat, 1.6 to 2.2 lbs. of digestible ash which is equivalent to 34 to 44 lbs. of starch value, or 73 000 to 90 000 digestible calories.

The average daily increase was 2.2 to 3.1 lbs. per 100 lbs. live weight.

The increase in live weight decreased progressively as the animals grew older. An increase in live weight of 1 lb. necessitated a ration of 1.2 to 1.8 lbs. of dry matter in the milk, 0.26 to 0.49 lb. of digestible protein, that is 1.1 to 1.9 lb. of starch value, or 2300 to 4100 digestible calories, which are equivalent to 7.3 to 10.8 lbs. of milk.

Of the different kinds of milk, skimmed milk corrected with sweetened flour starch was the least expensive form of food.

For a certain increase in weight, the youngest pigs required less food than older animals. The young pigs, during the experiment, assimilated from 36 to 74 per cent. of the digestible protein. The age of the pigs, together with the nutritive property of each kind of milk, influenced in a marked degree the digestion of protein. The younger the pigs, and the more nutritive the milk, the greater was the proportion of protein digested. The subjects of the experiment decomposed 2.6 to 6.1 lbs. of protein per 1000 lbs. live weight.

The physiological utilization of the different kinds of milk varied from 34 to 90 per cent. The young pigs used from 2250 to 3150 calories to gain 1 lb. in weight.

Rearing animals on skimmed milk corrected with flour and sweetened starch, and on homogenized milk, were the least expensive methods, and cost from half to two-thirds as much as the employment of whole milk.

Analysis has shown that the flesh of younger animals contains less nitrogen and dry matter free from fat, than that of older individuals. The analyses of the young pigs furnished data respecting the repartition of different substances and of chemical energy between the different organs. They further showed that Mangalica pigs produce more fat, while Berkshires produce more lean meat; this difference manifests itself very clearly from quite an early age.

827 - **The Nutritive Value of Maize Cob Meal.** — TANGI and WEISER in *Die landwirtschaftlichen Versuchsanstalten*, Vol. 81, Part 1-2, pp. 35-47. Berlin, 1913.

An account of digestibility experiments made by the writers with sheep; the ration was a mixture of crushed maize corn (75 per cent.) and crushed maize cobs (25 per cent.). The investigations showed that coarsely and finely ground mixtures of crushed maize corn and cobs were equally digestible, but not as digestible as maize corn.

828 - **Why Inbreeding Decreases Fertility.** — WENTWORTH, E. N. in *The Breeder's Gazette*, Vol. LXIII, No. 20, p. 1154. Chicago, May 14, 1913.

From the days of the earliest practice of inbreeding there seems to have been a definite idea that it caused degeneration of the stock, evidence of which was supposed to be shown in decreased size, vigour, longevity and fertility.

An experiment on this subject was started through an accident by which mice destroyed the cultures of fruit flies that the writer used for hereditary demonstration purposes in his laboratory work. From the wreckage three pupae were saved that gave a living pair of flies to start with. On mating, they produced 126 offspring.

In a previous article, the writer has spoken of the importance of the law of segregation on the tendency of characters present in preceding generations to separate out in certain individuals.

The offspring of the flies were divided into four strains, one high in fecundity, one low, and two medium. The interesting thing is that the high and low strains breed true, while the middle strains show in many individuals the segregating out of other types. Several hundred individuals were bred, but the table shows only the average production for each line.

Four pairs of flies from the 126 in the first generation, when inbred, gave the following number of offspring.

	High Line	Low Line	Two Medium Lines
3rd generation	128.7	35.9	78.9
4th "	134.6	30.1	81.2
5th "	132.2	29.7	83.7
6th "	135.6	32.7	68.1
7th "	133.4	28.7	60.1
8th "	140.1	29.4	71.3
9th "	138.0	25.7	69.1
10th "	141.3	24.6	66.3
Average	135.9	29.5	72.1

This shows the absolute distinctness of the three groups. When all the groups are added together and the averages taken, each generation after the fifth shows a decrease, similar to the experience of the practical breeder. The third generation equals 80.6; the fourth 81.8; fifth 109.8; sixth 101.5; seventh 98.1; eighth 78.0; ninth 75.5 and tenth 74.6.

The rapid lowering of the averages in the last five generations would be interpreted by the breeder, who thinks only in terms of averages, as an excellent proof of the injurious effect of inbreeding. We, however, see that the inbreeding was not at fault, for in the last generation the segregated high line gave its highest production, viz. 141.3 individuals. Only one lesson can be drawn from this, viz. that the breeder must study his animals individually. Those men who have succeeded by inbreeding have done so by their capacity for careful selection, while those who have failed simply waited for good characters to appear of their own accord.

Inbreeding does not cause degeneration; it only allows weaknesses to appear; and it also brings out the good points, so that the breeder need only select the most suitable animals for further breeding operations.

The distribution of the groups would indicate a simple pair of factors and a 1 : 2 : 1 ratio, as considered in Mendelian inheritance. This is only apparent, however, and more study is needed to completely elucidate the factors.

- 19 - **Maternal Inheritance and Mendelism.** - TOTAMA, K. (Zoological Institute, College of Agriculture, Tokyo Imperial University) in *Journal of Genetics*, Vol. 2, No. 4, pp. 351-405. London, February 1913.

The writer describes in this paper the results of experiments made by him during the last five years on the hereditary transmission of certain characteristics of form and colour in silkworms' eggs.

The different variations from the normal form and colour are given in a coloured plate.

The writer deals briefly with the origin of these deviations and gives the results of line breeding certain variants for some generations and of crossing breeds or variants possessing different egg-characteristics.

Numerous genealogical tables are given and the most important results are summarized in two chapters devoted respectively to general considerations and conclusions. A brief bibliographical notice of 13 publications is appended.

- 20 - **The Thirty-Seventh Fat Cattle Show in Berlin.** - AUGUSTIN and MEYER in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 19, pp. 217-221. Hanover, May 9, 1913.

The writer draws attention to the importance of fat cattle shows from the point of view of meat production, and then gives some information as to which districts took part in the last show and which breeds took most prizes. Illustrations are given showing many of the exhibits.

- 21 - **The Show of Stud Animals at Algiers.** - MANTOUT, SUISSE, CAUSSE, VERMEIL and CARDONNE in *Revue Agricole et Viticole de l'Afrique du Nord*, No. 59-60, pp. 390-409. Algiers, April-May 1913.

The writers mention the improvements in Algerian stock-breeding which they observed on the occasion of the last Show. Pictures are given of the different typical stud animals, and suggestions brought forward as to the means of promoting stock-breeding and increasing the number of head.

- 22 - **Horses Imported into the United States in 1912 for Breeding Purposes.** - Animals imported for Breeding Purposes, 1912, Horses. - U. S. Department of Agriculture, Bureau of Animal Industry. Washington, April 1913.

In 1912 a total of 3467 horses was imported under the new regulations into the United States for breeding purposes (Bureau of Animal Industry, Order 186 (1)). In the above-mentioned publication of the U. S. Department of Agriculture are given the sex, breed, name and studbook number, the importer, port of importation and the date of the arrival of each animal.

(1) See No 816, B. May 1912.

The following table gives a summary :

Breed	Stallions	Brood Mares	Stallions and Mares (*)
Belgian	609	347	956
Clydesdale	33	57	90
Boulonnais (French Draft) . . .	9	—	9
Hackney	14	12	26
Percheron	1104	859	1963
Shetland Pony	4	27	31
Shire	156	91	247
Standard Breed	1	2	3
Suffolk	10	15	25
English Thoroughbred	4	8	12
Welsh Pony	13	92	105
Total . . .	1957	1510	3467

(*) Some of these horses were imported in 1911 and are reckoned in here because the importation formalities were not concluded until after January 1, 1912.

833 - The Breeds of Horses in Rumania. — FITTE in *La Vie agricole et rurale* Year 2, No. 21, pp. 608-613. Paris, April 26, 1913.

In 1900 there were in Rumania 864 746 horses ; of these, 584 194 belonged to the Walachian, 193 062 to the Moldau and 87 490 to the Dobruja breeds. The districts richest in horses are Jalonitza, Ilfov, Dolj, Constanta Breeds : Moldau, Mountain, Jalonitza and Dobrudja. The last includes four types, of which two (the true Dobrudja and the Russo-Bessarabian type) are fairly widespread. This article contains a description of these breeds and the text is elucidated by illustrations.

834 - Horse Breeding in German South-West Africa. — WINKLER in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 40, pp. 373-374. Berlin, May 17, 1913.

Notes on the development and present condition of horse breeding (pictures of typical stud animals being given), the best breeding district and the natural conditions of horse keeping, together with an account of the Imperial Government Stud at Nauchas and its influence on breeding throughout the country and upon the supply of remounts. Suggestions with regard to breeding.

The Relation Between Live-Weight and Performance in Cows. — PETERS, I. in *Deutsche Landwirtschaftliche Tiermucht*, Year 17, No. 21, pp. 252-253. Hannover, May 23, 1913.

The writer has made some investigations, based on the data of the Dutch Herdbook Association, as to whether heavy or light cows turn their feed better account. The data for 1911 are given in the two following tables, which the animals are grouped according to their weight. The figures in Table I-A refer to herdbook cows, while those in Table I-B refer to cows which are not registered. All the cows were five years old.

TABLE I - A.

Weight Group	No. of Cows	Average weight lbs.	Milk yield lbs.	Milk-fat yield		Increase in live-weight lbs.	Units of (1) performance	Starch value used lbs.	Performance units per 100 kg (220 lbs.) starch value.
				%	lbs.				
Under 100 lbs.	67	1056.0	7101.6	3.26	231.6	59.4	113.6	3823.6	6.54
100-1208 "	263	1161.6	7403.0	3.22	238.0	77.0	119.9	3854.4	6.84
210-1318 "	464	1265.0	7799.0	3.24	252.3	59.4	123.4	3949.4	6.89
320-1428 "	304	1368.4	8109.2	3.22	261.1	55.0	126.3	3957.8	7.02
Over 1428 "	128	1482.8	7856.2	3.21	252.1	37.4	120.1	3938.0	6.71
Of all groups	1226	1280.4	7727.2	3.23	250.4	59.4	122.5	3920.4	6.87

TABLE I - B.

Under 100 lbs.	84	1031.8	6331.6	3.21	203.1	59.4	101.2	3592.6	6.20
100-1208 "	216	1157.2	6892.6	3.19	220.0	83.6	112.5	3746.6	6.61
210-1318 "	237	1258.4	7453.6	3.17	236.7	77.0	118.8	3999.6	6.54
320-1428 "	143	1366.2	7821.0	3.20	250.1	68.2	123.8	4142.6	6.57
Over 1428 "	32	1478.4	7312.8	3.20	234.3	70.4	117.2	3832.4	6.73
Of all groups	712	1234.2	7218.2	3.19	230.1	74.8	115.8	3896.2	6.54

(1) By unit of performance the writer understands 2.204 lbs. of milk fat, or 6.612 lbs. of body fat substance.
(Ed.).

From this summary, it is clear that light cows, on the average, are inferior performers. The larger milk yield of the herdbook cows as compared with the unregistered animals is attributed by Mr. Peters to the better constitution and resistance powers of the former.

Studies in Dairy Production. — WOLL, F. W. in *The University of Wisconsin Agricultural Experiment Station, Research Bulletin*, No. 26, pp. 55-135. Madison, October 1912.

These studies are based on the records secured at the Wisconsin Dairy Competitions in 1909-1911. The writer gives the methods adopted in calculating the value of the food consumed and of the milk produced (distinguishing between the value of the butter and that of the skimmed milk) and analyses the results from different points of view. The cows used for the experiment were Holsteins, Guernseys and Jerseys.

837 — **The Wool Industry in the British Dominions.** — BRAN, C. E. W. in *Journal of the Royal Society of Arts*, Vol. LXI, No. 3143, pp. 327-345. London, February 14, 1911.

A century ago, Spain was the only country which exported wool to England, for the Spaniards had developed a most valuable, white-woolled breed known as the "travelling sheep" — the Merino. The primitive ancestral sheep, the black Montanches, still exists in Spain and from the famous breed was evolved by selection of white-woolled specimens. The Spanish Merino was and is very hardy, picking up a living amongst the uplands during part of the year and then travelling along the cañals or stock routes, to better feed elsewhere.

In 1802, of the 8 000 000 lbs. of wool which England imported from abroad, over 6 000 000 lbs were obtained from the Spanish Merino sheep. Yet this was the time of the Peninsular War, which must have interfered considerably with this commerce, and moreover Parliament had put a duty on imported wool. In 1803 a deputation of English wool manufacturers who had been sent up to London, were informed of the existence of a breed of Spanish sheep in the colony of New South Wales. The proprietor of the flock was a young officer of the 20th regiment, stationed at Sydney but at that time in London with samples of his wool. In spite of the scepticism of many persons in Australia and elsewhere, he succeeded in convincing the deputation of the future of sheep-breeding in the Colony.

At the beginning of last century, Spain exported rather over 6 000 000 lbs. a year to England; in 1911 Australia sent 314 517 052 lbs. to England and New Zealand, which was uncolonized in 1803, sent 189 686 851 lbs., while Spain has long ceased to send any at all.

The duty imposed in 1802 applied to all imported wool, colonial or foreign, but in 1825 the duty was taken off colonial supplies. For 19 years the latter enjoyed preference, which resulted in a large increase in the colonial imports, but with the establishment of free trade the foreign imports became larger. Colonial wools, however, more than kept their lead, and at present control the wool markets of the world.

According to statistics, the whole world contains at the present time about 615 000 000 sheep. Of these nearly 93 000 000 are in Australia, 24 000 000 are in New Zealand and 22 000 000 woolled sheep are in South Africa. Thus these three new British States, which possessed hardly any flocks a hundred years ago, now have nearly 140 000 000 sheep. To these are added the flocks of Canada, the Falkland Islands and the British Isles, the total for these countries amounts to nearly 180 000 000 head. This excludes the sheep of British India, some of which are woolled, and the unwoolled breeds of S. Africa, yet it amounts to nearly a third of the world's sheep in numbers and very much more than that in value.

The importance of British dominions in the world's wool trade is shown in the following table:

	1910
<i>Empire.</i>	
Australia	708 644 403 lbs.
New Zealand	204 368 957 "
British South Africa	139 488 573 "
British India	54 458 894 "
United Kingdom	38 185 983 "
<i>Countries.</i>	
Algeria	22 124 480 lbs.
Argentina	332 010 555 "
Belgium	241 457 748 "
Chile	27 749 867 "
China	31 091 867 "
France	82 685 948 "
Netherlands	20 836 188 "
Peru	8 375 328 "
Russia	20 826 252 "
Spain	23 935 503 "
Turkey	40 156 583 "
Uruguay	92 782 796 "
Others	100 171 000 "
Total	2 189 350 925 lbs.

The way in which the Merino flocks were established in the British emments overseas was somewhat romantic. The Spanish Governemnt ined for some time the monopoly of Merino sheep, and the sending of animals outside of the kingdom was attended with severe penalties. between 1765 and 1809 on several occasions exceptions were made as impliment to a neighbouring king or government. In 1765 the Elec- of Saxony was presented with a flock, and in 1775 some animals from Spanish flock of Count Negretti were given to the Austrians. The on flock was established at Lohmen and gradually bred to an exquisite ness of wool. The Austrians placed theirs at Hostitz and bred for strong el-like bodies. Other sheep sent to France were tended at the farm at abouillet and bred for large frames and long wool.

Others again sent to Holland were partly reexported to the Cape of i Hope. In 1787 and 1791 a few Merinos were presented to King George ugland and kept on the Royal farm at Kew. Finally, a few head sent merica in 1890 and stationed at Vermont were developed to produce a expanse of wrinkled skin so as to increase their fleece.

Captain John Macarthur, the young officer from Sydney, had thirty sheep Bengal breed sent from Calcutta. They were skinny, long-legged, r-backed animals absolutely deprived of wool, but he believed that by using them with Merinos he would eventually obtain a flock with valu- fleeces, and with some difficulty bought three rams and five ewes from cal Gordon's widow, who was parting with her Dutch Merino flock. el Gordon had belonged to the Dutch East India Company and in his ge the Dutch Government had sent a small flock of Merinos to the Cape.

With the Merinos he had bought and the Bengal sheep, Macarthur laid the foundation of Australia's flocks at Elizabeth Farm. He first improved sheep by crossing the Bengal ewes with some Irish rams he had obtained, and then crossed the product with the Merinos again and again till he obtained wool of excellent quality and fleeces weighing on an average 10 lbs.

In 1801 he came to England, and in spite of the opposition of Sir J. Banks, received a concession of 10 000 acres of land and was allotted convicts as shepherds. He then bought seven rams and one ewe from George's Merino flock at Kew, which was, however, not in very good condition. Returning to Australia, Macarthur took up his great task and, after eighteen years — in 1822 — he was presented by the Duke of Sussex with two gold medals "for importing into England wool..... equal to the Saxony". It should be mentioned that the first Saxon sheep are said to have been exported into Australia only in 1825 or 1826, but soon after great numbers of these animals were imported into Tasmania and magnificent flocks were established there, while Victoria was colonized. Since then the Rambouillet and Vermont flocks have also been of their influence. In order to meet the demand for mutton, some of the Australian owners began to cross their sheep with large English Southdowns, but later fineness of wool became the only object of the sheep-breeder. In 1812, the average weight of the fleece of Australian sheep, including the head and skin, was 7 ½ lbs., while individual fleeces have run to as much as 40 lbs.

The South African sheep had much the same history, the fat-tailed Cape sheep with the whitest hair being crossed repeatedly with Merino rams. Here, curious cases of atavism occur even now. The modern Merino has been founded on Australian stud sheep, some of the rams costing as much as £1000.

Australia's success in the breeding of fine-woolled sheep has been mainly due to the fact that they can be raised there with practical attention throughout the year, and with but little other expense than the hire of a few shepherds. In order to protect the sheep from the dingo (a dog) and reduce the number of shepherds, the runs are enclosed with a fence of wire netting. Feeding in the sense understood by the English farmer is unknown and the animals graze on the natural pastures except in seasons of exceptional drought. In South Africa, sheep live very much as in Central Australian runs, except that in the waterless parts they have to be withdrawn during a part of the year. The great difficulty has been the jackal, but the fencing of the farms is minimising the danger. In the Falkland Islands the methods very closely resemble those of Australia, the sheep-farming industry in Patagonia was originally started by the English landers and is still fed by emigration from those islands.

The first stage of British dominions and colonies has generally been the pastoral stage. The land, or most of it, usually belongs to the Government and concessions are made of grazing rights on the payment of a small annual sum. The large tracts of land over which each man acquires grazing rights are called stations or runs in Australia and New Zealand, and sometimes also in the Falkland Islands, and ranches in Western Canada.

ne the Australian squatter, or Canadian sheep or cattle man, builds y comfortable homestead. With the development of roads and railways he increase of population, the best land about streams and waterholes quired by the Government for agriculture and is leased to settlers, gh this policy of the Government can scarcely be called in question, s given rise to more or less open warfare between the pastoralist and intruding farmer; the quarrel however usually adjusts itself and almost ys in favour of the latter. But there remains a sharp distinction be- n the pastoralists, who occupy great expanses of country for stock, the farmers proper. Some of the stations are of enormous size; the st in the Falklands is 700 000 acres and supports nearly 200 000 sheep. average size of a sheep run there is 12 000 acres with from three to five per sheep.

The pastoralist of Australia and New Zealand is a capitalist and usually ses good education and credit. He studies the literature dealing with work, and his methods of breeding and shearing are the most perfect e world and produce excellent wool. Certain stud farms in Victoria Tasmania, *e. g.* Wanganella, Boonooke and Uardry, have become famous he quality of their wool.

Shearing is done by machine shears and is effected between May and mber by professional shearers, who visit the different stations. The s are classified and sorted before leaving the shearing-shed by experi- i and conscientious persons, the wool of a station being sometimes class- into at least fifty descriptions, and the classifier may be paid as much as per week. In this way the highest prices can be obtained for the wool. Formerly such South African wool as arrived in London was miserably ed and got up and realized lower prices than Australian wool. Shearing (and still is) done by hand twice a year, and the trade was in the hands all dealers. But of late years great progress has been made in classing packing the wool, as well as in the trading methods. The industry has developed satisfactorily in the Falklands.

he wool sales in Australasia are remarkably well organised, being quite pendent of the intervention of middlemen. Formerly the chief sales held in London at the Wool Exchange in Coleman Street; but now- the greater part take place in Australia and New Zealand, while ig London market deals with supplies from the Cape, the Falkland ls and other parts.

wing to the transport, the average prices on the London market are r than those on the Australian markets, which are patronised by the ans (who buy heavily at Sydney), the French, the Belgians, the Dutch. The Australian squatter has from the first been able to sell his wool s own account in London on account of the great facilities for local t which he has always possessed.

in the last century, the great sheep runs and stations of the British re overseas were the most important sources of the wool supply, but very doubtful if they will continue to be so in the future, for two great ges are affecting firstly the class of wool from oversea and secondly

the class of grower by whom that wool is produced. The Government are cutting up large areas of stations and establishing farms in their place. It is from these farms that the wool of the future must come, and therefore the basis upon which the sheep-rearing industry has been established will be different.

After the discovery of the possibility of transporting frozen meat to sea, which revolutionized the food supply of England and greatly increased the wealth of Australasia, the colonists began to cross Merino ewes with rams of the long-woolled early-maturing breeds: Romney Marsh in New Zealand; Leicester, Border Leicester and Romney Marsh in Australia; Lincoln and Romney Marsh in the Argentine. In order to obtain both mutton and a quick-maturing lamb, crosses, or especially second crosses were made with short-woolled English sheep: Shropshires, etc.

Thus the class of oversea wool is changing; already more than a quarter of the wool from Australasia is cross-bred, and the proportion is continuing to increase. Crossing has been practised most in New Zealand and Argentina and least in Australia and South Africa. Cross-breeding in Australia: New Zealand consists at present in keeping pure-bred Merino ewes and British rams, and breeding one or two crosses from them. As an exception to this rule must be mentioned the fact that in New Zealand Merino ewes have been crossed with Lincoln rams and the half-bred offspring in-bred until the so-called Corriedale sheep has been produced.

The replacing of the big stations by closer settlements has reduced the standard of breeding; the farmer cannot afford to pay exorbitant prices for his rams as can the pastoralist (1), neither can he concentrate all his attention on his flock. Nevertheless the local Governments, especially in South Africa, are making great efforts to educate the farmers up to the excellent methods now employed on the big stations, while the system of co-operation, which is gaining ground in Queensland, may also help to maintain and render more secure the returns of the sheep industry.

Lastly, while the pastoral age of sheep-farming is probably destined to pass away altogether in New Zealand and Canada, it will never disappear from vast tracts of Australia and South Africa where the dry climate and poor soil make the general conditions unsuitable for agriculture.

It appears probable that a large supply of fine Merino wool will always come from the large holdings of Australia and South Africa, though increasing quantities will be produced by the cross-breds on the farms. The demand for wool is increasing in Europe, and is expected to increase shortly in America. It is growing fast in Japan, and the demand from China, if it comes into existence, is a factor hardly to be realized. The killing of sheep for freezing tends more and more to keep the numbers down and, even within the British Empire, the world's flocks seem to be decreasing. Everything points to a prosperous future for the wool industry, to the special advantage of the British Dominions in which it holds such an important place.

(1) \$1,600 was paid for the ram "President" in 1896, \$1,500 for "Admiral" in 1899, and \$1,500 for "Dandie Dinmont" in 1904. (E.A.)

Experiments with Figs. — CLARK, R. W. *Montana Agricultural College Experiment Station, Bulletin No. 89*, pp. 16. Bozeman, Montana, June 1913.

At the end of this Bulletin, the writer gives the results of eight pigling experiments with different proportions of various feeds: shorts, ley, frosted wheat, lucerne, sugar beets, blood meal, skimmed milk,

Other experiments were made in order to determine the most suitable for brood sows. Mr. Clark also deals with the returns from feeding brood sows and their litters for one year.

Further Report on Egg-laying Competitions in the Rhineland. — BOSCH, R. *Landwirtschaftliche Zeitschrift für die Rheinprovinz*, Year 14, No. 18, pp. 310-314, No. 19, pp. 327-330. Bonn, May 2 and 9, 1913.

The Chamber of Agriculture for the Rhineland has during the last three years conducted egg-laying competitions for poultry lasting ten months in 1 year, from November to August, at its special grounds. The results of first two years' work are given in the present report. The first year 210 year-old hens were tested and in the second year 210 two-year-old hens; in few exceptions in both competitions the same birds were used. Each of six breeds examined were represented by seven families, each consisting of five members.

The comparison between the total yield of the one-year-old birds and of the two-year-olds is considerably in favour of the former. During the months that the competition lasted the one-year-old hens laid 125 (worth 11s 3¼ d), the two-year-olds 102.4 eggs (worth 8s 7¼ d). Eggs laid in winter by the latter were only 34.71 per cent. of those laid by the former.

The following are the scores of the various breeds:

Breed	Average number of eggs laid	
	One-year-old hens	Two-year-old hens
Rhenish	104.7	124.1
Wyandotte	130.7	99.3
Minorca	126.5	99.6
Edge Italian	121.0	103.7
Orpington	119.8	92.1
e Orpington	111.3	95.5

The small breeds have thus proved more productive than the medium-sized, nevertheless the difference was not so marked among the one-year-olds as among the others. As for their behaviour during the various periods of the competitions the small and medium breeds gave one third of total yield during the first five months. The maximum number of eggs laid by the small breeds was in May for the one-year-olds and in April for the two-year-olds, while that of the medium-sized breeds was in both months one month earlier.

The writer then compares the yields of the best and the worst families and finds that in both competitions the Rhenish and the Italian breeds show the most uniform results. The Minorca families showed also in the first competition considerable uniformity, but less in the second. Among the medium-sized breeds the yields of the various families were very different and this the writer attributes to the still incomplete improvement of the breeds.

Lastly, concerning the weight of the eggs, the heaviest were those of the Minorcas (2.20 oz.) and of the White Orpingtons (2.11 oz.); the lightest were the Italians (2.03 oz.) and the Rhenish (1.98 oz.). The best layers accordingly produce the lightest eggs. The eggs laid by the one-year-olds were on the average 0.08 oz. lighter than those of the two-year-olds.

The writer reports upon the money value of the eggs and gives some advice on the keeping of egg-laying poultry.

840 - Irish Egg-Laying Competition, 1st October to 31st December 1912.
MURPHY, E. in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 2, pp. 303-306. Dublin, January 1913.

During 1912 it was felt that a fresh stimulus to the industry of rearing farm poultry in Ireland was necessary; to this end the Department of Agriculture and Technical Instruction arranged that the first Irish Egg-Laying Competition should be held at the Munster Institute, Cork.

The site selected was a level strip of land, which had never been used for poultry. The soil is very suitable, being a rich loam over limestone gravel, but there is no natural shelter.

The runs are 54 in number, 52 being occupied by competition birds. Every pen of six pullets is provided with a separate house and run. The latter is sheeted with boards on all sides to a height of 3 ft. The houses are well sheltered from the weather and are each provided with three trap-nests. All doors open on the passage, as do the trap-nests, so that trapping, feeding, cleaning, etc., can be done without entering the runs.

The pullets arrived at the place of competition on September 13, 1912, and the contest began on October 1.

The following were the breeds entered:

Breed	No. of pens entered
White Wyandotte	12
Barred Rock	8
Rhode Island Red	6
Buff Orpington	5
White Leghorn	5
Brown Leghorn	4
White Orpington	4
Red Sussex	3
Faverolle	3
Light Sussex	1
Minorca	1
Control pen (Rhode Island Red)	1

The 54th pen is used for broody hens.

Taking into account that this was the first competition held in Ireland, that most of the competitors were novices at selecting birds for such a test, the quality was very fair, and though too early hatching, immature and bad condition were apparent in some of the exhibits, only two died, and the health of the birds remained good in spite of the bad weather in December. The leading pens were all in splendid condition on sale.

The foods used were oats, maize, wheat, pollards, thirds, bran, linseed meal, meat meal, cut clover, hay, cabbage and milk. A supply of grit and is always available and the birds have water both inside and outside the house.

The writer gives a table showing the position of the different breeds, regards the number of eggs laid, as well as the price obtained for the eggs.

The number of eggs laid by the 10 best pens was as follows :

1. Red Sussex	296
2. White Wyandotte	293
3. Buff Orpington	244
4. Rhode Island Red	231
5. White Wyandotte	203
6. Buff Orpington	199
7. Rhode Island Red	195
8. Brown Leghorn	191
9. Rhode Island Red	189
10. Rhode Island Red	188

- **A Danish Eel Farm.** — GREEN, CHARLES in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 2, pp. 300-302. Dublin, January 1913.

On the north coast of Zealand in Denmark, just within the entrance of Ise Fjord, there has been established since 1905 an eel fishery, which, in its ingenuity and simplicity, is probably unique.

A dike had been constructed at Hov-Vig near the village of Ny-Kjøbenhavn with the intention of reclaiming a portion of land for agricultural purposes. That undertaking having been found unremunerative and abandoned, Nielsen, of Copenhagen, conceived the idea of turning it into an eel-farm.

Within the embankment there are about 300 acres under water; the water is fresh and, in a great part, only two feet deep; it is supplied by surface drainage of the surrounding land.

When taken over by Mr. Nielsen, the lake already held a small stock of eels which had doubtless found their way in through a sluice-gate situated near the centre of the embankment; this stock has been systematically increased by the introduction of elvers, captured as follows :

On the appearance of the eel fry in the fjord at the end of their long journey from the breeding grounds in the Atlantic Ocean, a rough crate heaped with water-weeds is lowered into position across the front of the sluice

gate. The latter is then raised so as to allow a stream of fresh water to flow through the crate. The elvers, in search of fresh water, make their way down the stream to the crate and remain entangled among the weeds, which in the course are lifted out and shaken over a piece of very fine-meshed net. This enables the proprietor to estimate the number of elvers introduced annually into the lake; the estimate is based on the weight of the elvers, of which about 1 500 go to the pound.

The capture of the mature silver eels for the market is effected by means of an apparatus designed and constructed by Mr. Nielsen. It can be worked by him single-handed, assistance only being required occasionally for heavy work. Slung from a frame-work of rough poles is a box, or chest, about twelve feet long; round the sides of it are openings about nine inches square, each provided with a small conical eel net of the ordinary shape opening internally into the box, and a row of holes which permit the circulation of the water and the escape of undersized eels. The central part of the box is carried up so as to be above water when the main part is submerged, and a hatch in the side of this vertical prolongation gives access to the interior.

On the bank is a windmill by means of which salt water from the fjord can be pumped into a channel leading at either end to a wooden sluice.

The day before a consignment of eels is to be taken, the windmill is set in operation, and a continuous stream of salt water is discharged in front of either box, in order to collect the mature eels by taking advantage of the migratory impulse involved in their condition which leads them seawards. The box is lowered into the water at nightfall by means of the gear winch at each end of the frame, and the stream of salt water is led in to the box by an extension of the wooden shoot. The eels are thus enticed into the box, which is subsequently hoisted for their removal. At the time of the writers' visit to Hov-Vig there were two of these boxes in use.

To control the increase of salinity in the water of the lake, due to salt water pumped in and to evaporation, a second windmill is installed, which fresh water can be pumped in when required from a neighbouring land-drainage canal.

The lake contains a large number of *Mysis* and apparently no natural food to support a certain stock of eels. Mr. Nielsen, however, supplies a considerable quantity of artificial food consisting of unmarketable fish (which is minced in a machine driven by a rope-belt from the first mentioned windmill and thrown loose into the lake); this proceeding regards as still of an experimental character, though he believes it has a stimulating effect on the growth of the eels.

The subjoined figures show that the success of the enterprise is fairly evident. The elvers turned down in 1905 would normally begin to reach maturity in five or six years, and that a large number of them have done so is clear from the sudden increase in the yield of marketable eels in 1910 and 1911.

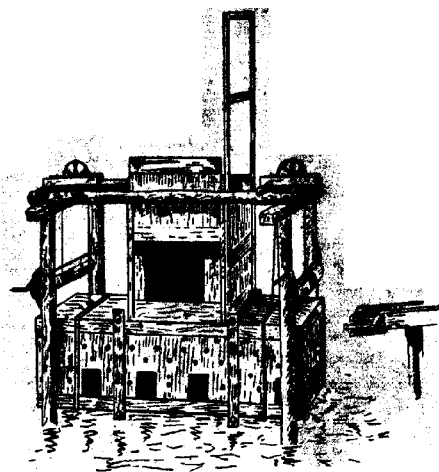


Fig. 1
Eel-catching box raised out of the water.

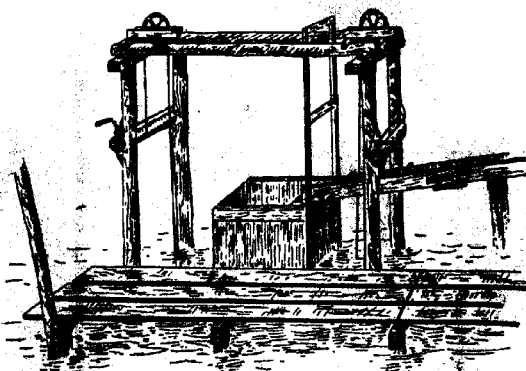


Fig. 2
Salt water being pumped into eel-catching box.

Year	Number of civers turned down in lake	Catch of marketable eels in cwt.
1905	49 000	—
1906	60 000	27 $\frac{3}{4}$
1907	128 000	45 $\frac{1}{4}$
1908	100 000	40 $\frac{1}{4}$
1909	100 000	22
1910	60 000	78 $\frac{1}{2}$
1911	70 000	136 $\frac{3}{4}$
1912	159 000	—

FARM ENGINEERING.

Trials of Motor Tractors in Algiers. — VENTON-DUCLAUX in *La Vie Agricole et Rurale*, Year 2, No. 23, pp. 660-667. Paris, May 10, 1913.

The ploughing competition, held in connection with the Show of Motors and Agricultural Machines organized by the French and Algerian Automobile Clubs at Algiers (March 22 to April 20), lasted two days. It took place in the presence of the President of the French Automobile Club and of the Mayor-General, on ground about 17 miles from Algiers.

Seven firms took part in the competition: Mac Laren, Case, Avery, Arion, the Stock Motor-Plough Co. Ltd., and the Franco-Hungarian Society. Seven machines in all were tested.

The writer gives in his paper a description and figures of the different tractors, and of the conditions of the trials. No classification was made of the performances.

The judging committee expressed the wish that the constructors should draw their attention to devising machines for the Algerian market, taking into consideration the special conditions and requirements obtaining in Algeria.

Eckert's Plough Wheel Nave. — MARTINY in *Landwirtschaftliche Umschau*, Year 5, No. 20, pp. 459-460. Magdeburg, May 16, 1913.

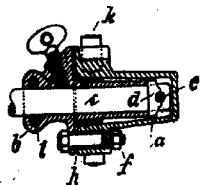
The construction of the wheel naves of agricultural field machines has the greatest importance for the lightness of draught and durability of the machine.

Formerly in the closed naves a ring was forged on the wheel axle to prevent the wheel from slipping off, but when it began to be much worn it had to be replaced by another one. The nave and the set of spokes were separate pieces and the disks that joined them were also separate pieces, so that in taking to pieces or fitting up such a wheel a number of parts had to be dealt with.

In the most recent model of closed naves (see fig.) this difficulty is avoided. To prevent the wheel slipping off, a loose ring (d) is put on the axle and kept in its place by a pin (e). This ring abuts immediately against

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the disk (b) which acts also as box to the wheel. The packing which up the space between the axle and the disk is situated in the hollow of the disk (b). Between the nave (a) and the disk (b) a cardboard (h) is placed; this acts also as an elastic to prevent fractures. The result is simple in construction and in fitting.



To take it to pieces only the two (f) have to be loosened and the set of (k) with the nave (a) attached to it slipped off the axle. On removing the part the ring (d) and the disk (b) can be removed. These are no other parts. All the working parts are interchangeable, and they

proof against the entrance of dust.

The leakage of lubricants is also impossible. Smooth running only a small amount of lubrication is obtained by the milling of the and perfect construction of the working parts.

The above-mentioned details afford an example of the degree to which certain parts of machines may be improved.

844 - Patent Implement for Singling Beets (German Patent 248355). — *Landwirtschaftliche Presse*, Year 40, No. 23, p. 279. Berlin, March 19, 1913.

This implement made in one piece combines two utensils required for the singling and hoeing of beets. As the annexed figure shows, one end of the tool is formed by a curved blade with cutting edges on both sides (b) and in front (a). At the other end there is a narrow knife bent obliquely at an obtuse angle. Between the two ends a wooden handle is situated.

By means of this implement the beets may be singled, weeds removed and the earth loosened. The curved blade (a) is driven into the ground in the immediate vicinity of the plant that is to be left, and the edges (b) are pressed and turned right and left in the ground about it, thus destroying the unnecessary beets and weeds. The cutting edge (c) is used against weeds reaching low down. The blade (a) is bent in such a way that the edges (b) are situated almost parallel to the handle, but in such a way that the operator's hand does not come into contact with the soil.

The bent knife (d) at the other end of the implement is used as is well known, for singling other beets, hoeing and loosening the earth at a greater distance from the beet which is left.



Crushing Mill "Unica No. 2" with "Unica" Sifter.

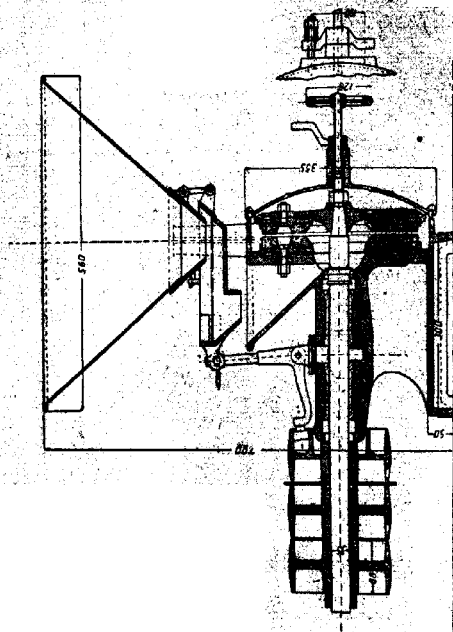


Fig. 1. — Longitudinal section of mill.

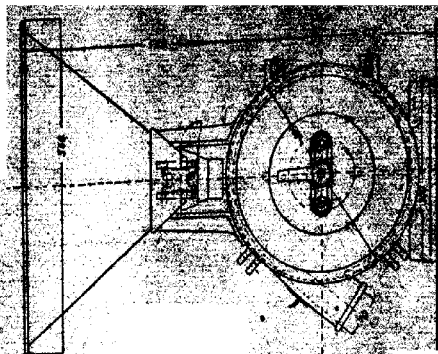


Fig. 2. — Front elevation of mill.

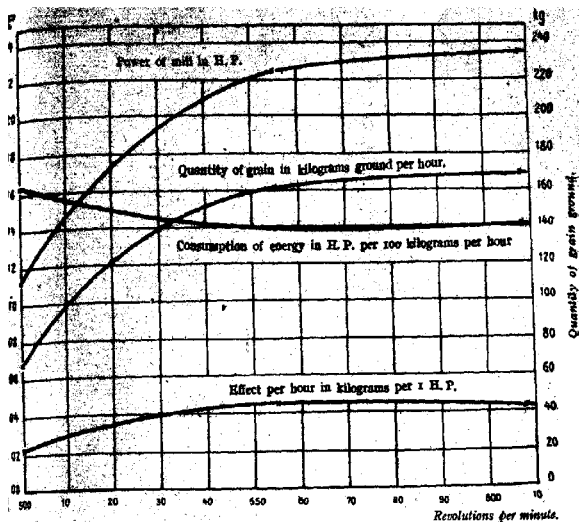


Fig. 3. — Diagram of the work done and of the work absorbed by the mill according to the number of revolutions.

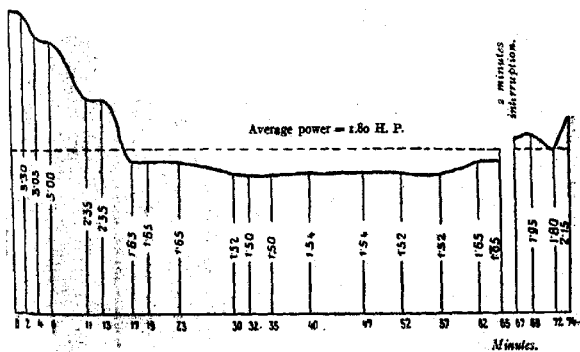


Fig. 4. — Diagram of consumption of energy required for grinding 55 lbs. of rye.

The Roller and Packer. — BOWENBERRY, H. B. in *Montana Agricultural Experiment Station, Circular 21*, pp. 26-32. Bozeman, February 1913.

The writer describes the construction of cement corrugated rollers, are of two types: those made with wheels of cement with bare faces, those with cement wheels having steel faces.

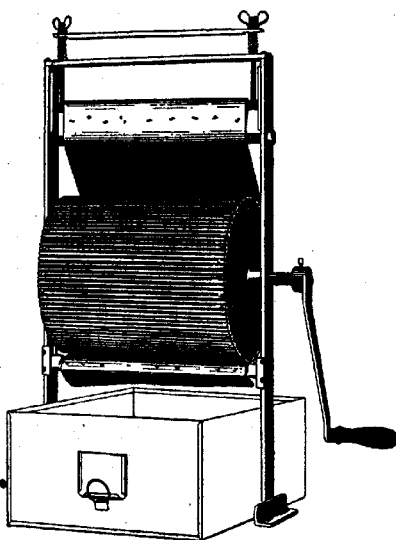
Among the illustrations accompanying this circular is one of a corrugated roller of which only the discs, which are placed loose on the axis, are of steel, the rims being of steel, while another figure shows a roller made entirely of cement.

A Hand Grain Thrasher. — BRIGGS, L. J. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 119*, pp. 23-24. Washington, March 29, 1913.

The simple hand thrasher shown in the accompanying illustration has proved very useful in thrashing small quantities of grain from experiment

It consists of a hand-cranked rubber-covered cylinder 8 inches in diameter and 12 inches long, mounted on a stationary frame, the tension of the rubber, and its distance from the cylinder, may be adjusted at will.

The frame of the machine is of steel, and the cylinder is built up of disks of wood 2 inches thick glued together. The cylinder is covered with rubber, the corrugations of which are parallel to the axis. The rubber is secured by bolts and staples and can easily be removed when worn. The apron is made of rough canvas or similar material.



Essential features of the machine are the care with which the position of the apron and its distance from the cylinder can be adjusted. The machine can also easily be cleaned.

American Cereal Separator. — H. J. in *Zeitschrift des Vereins Deutscher Ingenieure*, Vol. 57, No. 21, pp. 809-812. May 24, 1913.

The writer treats first of all of the various types of separators which attend the separation of cereals. He then describes several types: 1. The

Bureka drier, built by S. Howes of Silver Creek, N. Y.; 4. McDaniel's 5. Morris' drier and the paddle wheel drier of E. F. Mead of New York. The great quantity of air used in the American driers is remarkably less than 400 to 480 cubic feet per 100 lbs. of grain, representing a waste of heat and of power. Though the American types of driers deserve to be studied, they cannot be considered as the last word in the question of cereal esiccators.

848 - Ventilator for Chaff-Cutting Machine, built by Wilhelm Graf, Maschinenwerke, Karlsruhe i. B. (German Patent 187611). — HOLLDACK in *Mitteilungen des Verbandes landwirtschaftlicher Maschinen-Prüfungs-Anstalten*, Year 7, Part 1, pp. Berlin, 1913.

This ventilator for chaff-cutters is built in several sizes. Size N weighing 440 lbs. and costing about £ 25 in 1911-12, was submitted for careful test at the Royal Württemberg Machine Experiment Station Hohenheim. It appears very advisable in large farms, especially where valuable horses are kept, to ventilate hay and straw at the same time that they go through the chaff-cutting machine. The fragments of clover leaves and similar forage that get removed with the dust form a negligible quantity compared with the mass of forage treated, and when they are of good quality they may be kept and fed to pigs.

The machine is solidly built and has proved durable. It requires a motor of about $1\frac{1}{4}$ H.P. to drive it.

849 - Trial of a Meal and Groat Mill, "Unica No. 2", and Attached Sifter, A. Fiebinger's I. Styrian Milling Machinery Works in Graz. — REZEK, in *Mitteilungen der landwirtschaftlichen Lehranstalten der K. K. Hochschule für Bodenkultur in Wien*, Vol. I, Part 4, pp. 385-389. Vienna, May 8, 1913.

A simple solid wooden framework bears the meal and groat mill. It contains the sifter in its central part. The lower extremity of the framework is fashioned like a box and holds two drawers for the reception of the ground product. The individual details of construction of the mill are shown in section, fig. 1, and elevation, fig. 2, and do not require special description. The total weight of the machine is 482 lbs.

The machine was tested on July 10, 1912. A continuous current electric motor with switch regulator was used as driving power, and the work done was measured with precision by electric instruments.

At first barley was ground to fine grit for 13 minutes. Then oats were ground for 10 minutes, and after these coarse ground yellow maize was experimented upon three times in succession.

More complete tests were made with rye. The observations and results of these experiments are shown in the graph, fig. 3, which shows also the most favourable number of revolutions for this mill is about 560 to 580 per minute.

Determinations were made of the amount of force required by the mill and sifter, including the loss to the belting. From the values shown graphically in fig. 4, the average power required is 1.80 H.P. for the mill, the total amount for the mill and sifter is 2.2 H.P. for 5 lbs. of rye in 2.2 H.P. hour; the maximum, as shown by the graph, is 2.5 H.P. for 5 lbs. of rye in 2.5 H.P. hour.

From the above it appears that the mill performs a relatively large amount of work with a small consumption of power, and that it would be economically advantageous to those farmers who, besides preparing coarse feed for their live stock, wish to grind their grain for baking purposes.

Testing the Hourly Performances of the Hand Centrifugal Milk Separator "Balance No. 61" for 325 litres) of Holler's Carlsbütte Factory in Rendsburg. — REZEX, J. in *Oesterreichische Milcherzeuger-Zeitung*, Year 20, No. 8, pp. 115-118. Vienna, April 15, 1913.

On November 28 and 29, 1912, this centrifugal separator weighing 3679.3 lbs.) when in working order and costing £ 12, was tested at the Testing Station for agricultural machines and implements in Vienna, which belongs to the "K. K. Hochschule für Bodenkultur".

The writer first gives a detailed description of the machine and then reports of the tests and their results. The relation between the force expended and the work performed by the centrifugal apparatus was estimated, both by an electric process of measurement, and by Leuner's spring-galvanometer.

A total of 17 cream separation operations were carried out, the results of which are tabulated. According to these data, in ordinary dairy processing only 0.12 per cent. of fat, on an average, is left in the skimmed milk; this may be considered a very creditable performance. With a decrease of 20 per cent. in the number of revolutions, the average increase in the content of skimmed milk was 0.22 per cent. and when the temperature of the milk fell to 20° C., the percentage of fat still remained at 0.21.

The machine makes very little noise when in motion. Its construction is simple; all the different portions are easy of access and are very well made. No particular skill is required in taking the apparatus to pieces, or in cleaning it and putting it together again, and the whole operation only occupies a few minutes. The cleaning of the discs is much facilitated by the presence of a wire rod upon which they are threaded.

Taking the results as a whole, a very favourable judgment was passed on the apparatus in question.

Temperature Regulator. — SCHOLTZ, M. in *Milchwirthschaftliches Zentralblatt*, Year 42, Part 10, pp. 301-305. Hannover, May 15, 1913.

It is not an easy task for the employees of a dairy to keep a constant and uniform temperature in the apparatus for warming milk. The writer has devised a regulating device which has the object of rendering the warming of milk and keeping it uniformly at the required temperature much easier. This new regulator is distinguished by the facility with which its component parts may be changed; it is constructed on the principle that the expansion or contraction of a body causes a change in position, which is placed in the outflow, closes or opens the valve leading to the heater. The admission of steam is thus regulated in proportion to the temperature of the outflow. The writer gives, in his description and illustration, of the three types of this new

832 - Review of Patents.

Machines for Tilling the Soil

- 259 892 (Addition to Patent 228 891) (Germany). Gang ploughs for working the soil various depths.
 59 632 (Austria). Motor plough.
 59 633 (Austria). Cultivator.
 1 061 354 (United States). Spring-tooth cultivator.
 1 061 291 (United States). Automatic adjusting plough.
 2 150 (England). Motor plough.
 130 182 (Italy). New system of mechanical ploughing with electric, steam or gas power.
 59 816 (Switzerland). Motor plough.
 59 817 (Switzerland). Cultivator.
 258 861 (Germany). Farmyard manure spreader in which the manure is comminuted by a cutter before being spread.
 59 813 (Austria). Manure spreader.

Sowing machines.

- 259 261 (Germany). Multiple furrow potato drill with chain of cups under the hopper.
 59 572 (Austria). Sowing machine.
 59 573 (Austria). Steering gear for machines cultivating rows.
 1 061 517 (United States). Mechanism for grain-drill.

Mowing machines.

- 259 532 (Germany). Reaper and binder with movable motor to be placed on the frame.
 6 578 (England). Agricultural mowing machines.
 8 763 (England). Attachments for mowing machines.

Threshing machines.

- 1 060 890 (United States). Threshing machines.
 7 971 (England). Threshing machine.

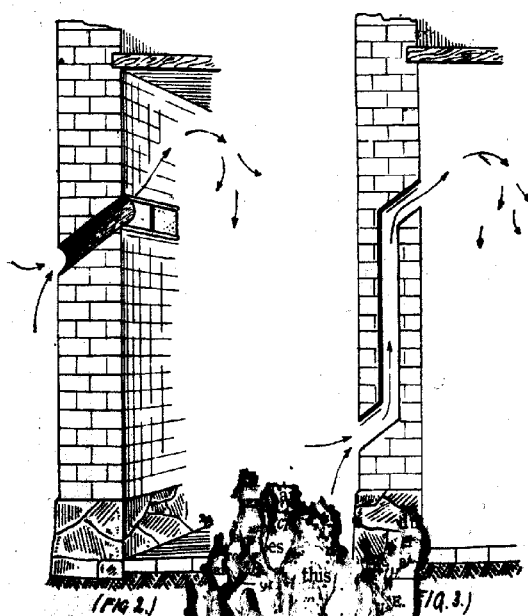
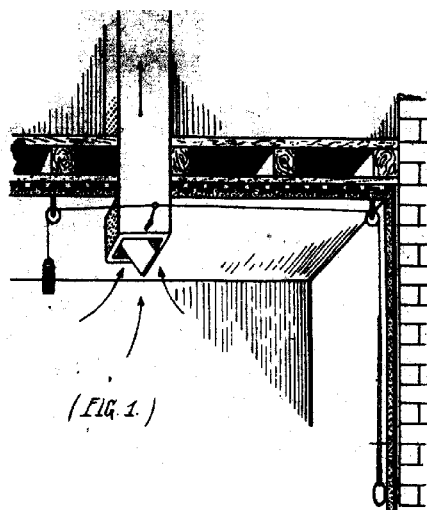
Other agricultural machines and implements.

- 59 815 (Austria). Machine for beating out scythes.
 59 808 (Austria). Agricultural watering machine.
 1 060 828 (United States). Milking machine.
 129 433 (Italy). Grain drier.
 130 358 (Italy). Drier for rice, maize, etc.
 59 818 (Switzerland). Automatic hay lifter for carts.

833 - Systematic Ventilation of Stables. — *Deutsche Landwirtschaftliche Year 17, No. 16, pp. 191-192. Hannover, April 18, 1913.*

In the proper ventilation of a stable, the vitiated air must escape be replaced by pure air without draughts being formed or the temperature being lowered.

The escape of the foul air is easily obtained by means of one or more vertical flues in the roof of the stable. The upper end of the flue must sufficiently high that the motion of the air in it should not be affected the outer currents of air, and the aperture projecting 6 or 8 inches the stable must not be situated directly over the animals. The escape flue may be in the middle of the roof or at the end opposite to the aperture by which the fresh air enters (see fig. 1).



vantage that, wood being a bad conductor of heat, they do not easily cool, which would retard ventilation. If the stable is not immediately under the roof but under other rooms or a hay loft, the shaft must have a fire-proof lining on the outside; in order to draw well it should also be provided with a suction-cowl at the top. The section must be 8 X 8 inches for three head of large stock, 10 X 10 in. for six and 12 X 12 in. for nine head. For more than nine head it is advisable, to use several shafts. As it is sometimes necessary, especially during stormy weather, to close wholly or partially the opening in the roof, the shaft is provided with a shutter.

2. As for the introduction of pure air, this is still simpler. According to practical experience the aperture which admits the outside air is most advantageously situated at about two thirds the height of the stable. As Fig. 2 shows, a simple hole in the wall, obliquely ascending from the outside to the inside, is sufficient. The cold exterior air flows into the upper part of the stable where it gains some warmth and then spreads throughout the stable. If the intake be placed too high the draught in the ventilator is diminished or even ceases. These openings must also be provided with sliding shutters to admit of their being closed when necessary. Their cross-section should be 5 X 10 inches for every three head of large stock. In new buildings glazed earthen pipes can be conveniently built into the walls as in Fig. 3, the inlet being situated about 20 inches above the ground.

RURAL ECONOMICS.

1. - Calculation of the Cost of Production in Peasant Farms, with Special Reference to Milk. — PAULI, W. in *Archiv für exakte Wirtschaftsforschung*. Supplement, Part 7, pp. XI + 333. Jena, 1913.

In the introduction, the writer lays stress on the importance of the calculation of the cost of production, from the scientific and social points of view, as well as from that of private economy. He then reviews the theoretical and practical evolution from its origin, at the beginning of the seventeenth century, up to the present time in which it has attained considerable development.

The methods pursued now in the calculation of the cost of production of agricultural staples may be divided into two groups: 1) those in which the costs of production are deduced from the results of the single branches (accounts), or "account" or "partial" methods; 2) those in which the costs of production are deduced from the results of the farms, or the "totality" or "synthetic" method ("Gesamtertragverfahren") of Laur.

The analytical method is based on the book-keeping by double entry (systematic) in which account is kept of the exchange products and the special products (e.g., milk, butter, etc.) with them (partial calculation). This method is based on the arbitrarily chosen prices (spec.

can only be answered for each single case according to the extent of the farm, the degree of culture of the farmer and the kind of production.

The results of the analytical methods of calculation in agriculture are in a great measure dependent upon: 1) the choice of the unitary price adopted for the calculation of the produce; 2) the distribution of the cost of labour, 3) the distribution of the cost of manuring among the various crops of a rotation.

In the selection of the unitary prices to be employed in the calculation the following are to be distinguished:

1. Values of cost of production.	}	Absolute cost.	}
2. Purchase price delivered at the farm.			
3. Relative purchase price (calculated on the purchase prices of equivalent wares, capable of replacing them, delivered at the farm).	}	Relative or deduced cost.	
4. Relative cost of production (calculated on the cost of production of equivalent wares).			
5. Sale prices at the farm	}	Realization values.	
6. Relative sale prices at the farm (calculated on the sale prices of similar products).			
7. Transformation value (value of produce that has been worked up, minus the cost of transformation).			
8. Relative transformation values (for by-products calculated on the transformation value of the principal product).			

Before selecting the values which are to serve as prices in drawing up the various accounts, some economic considerations are to be made according to the following principles: In the account the values here given are to be taken:

1. The cost of production, when the other purchase prices are high and the realization values, especially the sale prices, are lower than the cost of production.
2. The purchase prices for goods delivered at the farm, when the latter are inferior to the costs of production.
3. The sale prices, at the farm, when these are higher than the costs of production.

When the costs of production and the realization values of a commodity are to be determined for a whole country (or for a political economy) the prices of foreign markets are to be taken into account. As a rule, though, the market price is to be taken. The difference between purchase and sale prices at the farm, that is, the cost of production, is to be taken into account. As a rule only the cost of production is to be taken. These commodities the price of which must not be paid at the place of production are delivered at the market price.

The best distribution of the cost of labour is according to the number of work days, distinguishing between summer and winter work days, and between the work of men and that of women (Method of the Deutsche Landwirtschafts-Gesellschaft and of Laur). The cost of management is included in the general expenses and distributed with these.

For the distribution of the cost of manuring within the rotation, the writer recommends two simple methods, of which one considers the unexhausted manure given, and the second assumes that the amortization is balanced by the subsequent manuring. The first method starts from the money value of the original quantity, to which the cost of applying the manure is added, and one half of the total is debited to the second crop. In commencing this calculation it should be sufficient to determine the amount of manure given during the last three years and then reckon one half the manure given the last year, one quarter that of the second year and one eighth of that of the third year. The gain in nitrogen due to the roots and stubbles of leguminous plants may in both methods be considered as manure. In the second method the meadows and every rotation are considered as units which are debited with a certain amount of manure. The cost of manuring is divided, within each rotation, among the various crops in proportion to the gross yield of each. This method gives approximately accurate results so long as the rotation is kept uniformly manured.

For several practical reasons the calculation of the cost of production according to the analytical method, as well as the book-keeping by double entry upon which it is based, cannot be carried out on peasants' farms. On these only the synthetical method (Gesamtkalkulation), based upon a system of book-keeping by single entry uniformly carried out, can be applied, and this also only by strict comparative working up of the results of a large number of farms. In this synthetic process the difference of the net revenue (Reinertragsdifferenz, or difference between the net revenue and the normal rate of interest of the farm capitals which concur in yielding product) expressed as percentage of the gross revenue, which percentage gives the difference between the cost of production and the prices of the products. If the unit price of a product is known, its cost of production can be easily calculated.

In specialised farms, the risk and consequently the difference of the net revenue, in the calculation of the cost of production of the principal product, may devolve entirely upon this product. Thus, for instance, the production of milk in a dairy farm, especially where the synthetic method is convenient for the calculation, is a method of calculation, especially for the central offices of agricultural statistics, which are in a position to group the farms, which are of different points of view. The manner of calculation of the cost of production of the products has the greatest influence on the result of agricultural statistics. The gross revenue is the result of agricultural production, the quantity of the product, multiplied by the price, or the value of the product, thus determined or also by newly acquired prices. These gross amounts are calculated.

of produce in kind supplied to the farmer's household, family and employees from the changes in the inventory in the course of the year. The products supplied in kind are chiefly to be valued according to the market prices at the farm. On the other hand, the valuation of the inventory should be made according to the cost of acquisition, so long as this is not in excess of the realisation prices. The writer gives the tabular form adopted by the Swiss Peasants' Secretariat for the calculation of the gross returns and their distribution among the various accounts. Even if this calculation of the gross returns does not include completely and exactly some accounts and some groups of capitals (plantations of trees and vines, and live stock) and therefore keeps the total gross returns somewhat too low, the result of the calculation of the cost of production is not thereby much affected and at most to the average extent of about $\frac{1}{2}$ per cent.

The working expenses consist ultimately of labour and capital, the fundamental factors of agricultural production, because in farming undertakings even the natural factors appear from the economic point of view as capital.

In the valuation of labour, the value of the management and capacity of organizing possessed by the farmer has also to be considered, well as the labour of the other members of his family, which have to be reckoned somewhat dearer than that of strangers.

The capitals employed in farms are divided by Laur into "elementary capitals", which he arranges into higher groups. For the calculation of the interests that each elementary capital is to bear he gives the following rates:

For capital in land	3.5 to 4	per cent.
" " in buildings, improvements and forest trees	4 to 4.5	"
" " in fruit trees and vines	5 to 5.5	"
" " in standing crops	6	"
" " in live stock	<div style="display: inline-block; vertical-align: middle;"> <div style="display: inline-block; vertical-align: middle;">productive stock</div> <div style="display: inline-block; vertical-align: middle;">5.5 to 6</div> </div>	"
	<div style="display: inline-block; vertical-align: middle;">draught animals</div> <div style="display: inline-block; vertical-align: middle;">5</div>	"
	<div style="display: inline-block; vertical-align: middle;">fattening "</div> <div style="display: inline-block; vertical-align: middle;">4.5</div>	"
" " in machines and implements	4.5	"
" " circulating capital (provisions and cash).	6	"

Thus an average rate of interest is 4 to 4.5 per cent. for the capital (taking into account the valuation of the various elementary capitals that make up the total capital) the interest would be 4.31 per cent.)

Besides the interest, there are other charges which weigh upon products for amortization. The cost of upkeep concerns especially improvements, buildings, machines and tools. It is not easy to give, for the amount of amortization, a definite figure, because the depreciation of the nature of each item of capital is determined by its place in the production process. The writer

commends that all the State taxes, or at least all the communal taxes which weigh on the farms as land tax, should be included in the working expenses. In the conclusion of this first (general) part he gives in the form of a table a summary for the calculation and division of all the working expenses.

In the second (special) part of his work the writer calculates according to the synthetic method the cost of production of milk in the Swiss peasant farms, basing his figures on the data elaborated by the Book-keeping Office of the Swiss Peasants' Secretariat during the years 1905-1909.

He shows first that the calculation of the probability of errors should be applied to the calculation of the cost of production in order to determine the limits of error in the individual and average results. In the following results of calculations the writer gives, in the tables, the probable mean oscillations calculated according to the usual method of minimal square, so that their ratio to the actual differences of the results to be compared can be easily seen and thus the value of the average results for practical conclusions may be measured.

For the calculation of the cost of the production of milk only the results of typical dairy farms were used: These were further divided:

- 1) According to the system of cultivation :
 - a) Farms based on pastures and meadows.
 - b) Farms based on clover-leys, pastures and meadows.
 - c) Other farms (based on three-year rotation, or with meadows, pastures and field crops).
- 2) According to the manner of replacing the live stock :
 - a) Farms without breeding stock.
 - b) Farms with breeding stock.
- 3) According to the mode of utilizing the milk :
 - a) Farms with retail sale of milk.
 - b) Farms with wholesale sale of milk :
 - α) in which the milk by-products (whey and skimmed milk) return to the farm,
 - β) in which the milk by-products belong to the buyer of the milk.
 - c) Farms which work up their own milk.

According to the arithmetical means of the years 1905 to 1909, the average cost of production of 100 lbs. of butter (22 gallons) of milk on the farms is shown in the following table:

The largest item in the cost of production is labour. Doubling the price of land and keeping the price of labour constant (or doubling the price of labour and keeping the price of land constant) does not increase the price of wheat very much (about 10 per cent.) does not increase the price of wheat very much (about 22 gallons.

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...tion a great

milk, while in districts with less than 43.3 inches (110 mm.) it was the clover, pasture and meadow farms that did so. The ratio between these two types of farms in districts where the rainfall is between 43 and 47 inches cannot be determined from the results at present available. Of the other forms of farms (improved three-year rotation and similar forms) it appears that the production of those receiving upwards of 47 inches of rainfall is dearer than that of the pasture and meadow farms, and that of those getting from 43 to 47 inches is dearer than that of grass and clover farms; in districts with rainfall from 39 to 43 inches, and also below 35 inches, production on such farms is dearer than on the clover farms. Considerably increasing wages favour the grass farms, while strong rises in the prices of commodities favour the clover farms.

Supported by these results the writer recommends, in connection with the production of forage and of milk: 1) in districts having a rainfall higher than 47 inches to keep up the pastures and meadows or to introduce them and to abandon clover farming; 2) to transform the improved three-year rotation in districts with less than 43 inches of rain into clover farms, and where the rainfall is above 47 inches into meadow and pasture farms, and in the intervening districts into clover and grass farms. The decision of the question whether in the last-named districts clover or grass farms are to be preferred rests chiefly with the conditions of the soil and labour.

As for the influence of the manner of keeping up the dairy herd on the cost of producing milk, it appears from the accounts examined that those farms that only milked purchased cows produced their milk more cheaply in the years 1905 to 1909 than those that bred their milk-stock. The fitness of the former is due to the high prices of the produce and especially to the lower cost of production. High rates of wages increase the cost of breeding more than they do the production of milk, and thus, other conditions being equal, those farms that do not breed. Great rises in the prices of stock, on the other hand, favour breeding farms.

With the object of recognizing the influence of the utilization of milk the cost of producing it, the groups divided according to systems of utilization (retail or wholesale disposal of milk) were subdivided according to system of farming, then according to this and to the rainfall. Both calculations agree in attributing a higher cost of production to farms practicing retail sale of milk than to those dealing wholesale. The relatively small differences are chiefly due to the greater work of retailing.

With the increase in the cost of the production of milk reduced to unit of 1 lb. per gallon, the law of diminishing returns holds good. The gross returns of milk for a certain area increase with the increase of density. Every additional cow produces more milk to become a high profit factor. But the cost of production, this is determined by the knowledge of the selection of the stock.

of the most advantageous degree of intensity. The calculation of the cost of production must be completed by a comparison with the current prices of the profitability of an undertaking. The writer consequently investigates the influence of the intensity of the farm upon the land rent and the income, and draws the following conclusions from the results of his calculations: With diminishing cost (improvement of technique, etc.) and increasing prices of production, the optimum degree of intensity moves upwards. Inversely it moves in the opposite direction: 1) with stationary cost and returns in kind the prices of produce sink, 2) with stationary prices of produce and returns in kind the prices of the components of the cost of production rise, and 3) when with stationary returns in kind the prices of produce rise less than the costs of production.

But when it is a question of determining whether it is advantageous or not to diminish the existing degree of intensity of the farm, account must be taken not only of the change in the returns from the land, but also of the net returns of all the capitals employed in the farm and not utilized elsewhere, as well as of those necessary to the farm; further, in peasant farming the possibility of utilizing completely the available labour must be considered. In general it may be held that the optimum degree of intensity is shifted by changes in the technique, by the height of the prices of the components of the cost of production and by the prices of the produce obtained. It follows that the optimum degree of intensity has to be determined for each individual case.

If it is desired to know what prospects of profit a certain kind of production holds out, the changes in the results and the calculation of returns and of the cost of production caused by the variation in the market conditions have to be examined by a combination of the synthetic method with that of speculative calculation. The results given by book-keeping show the distribution of the gross returns and of expenses on the various items of outlay and gross returns, as well as the ratio of the returns to the outlay under the market conditions prevailing at a certain time. The speculative calculation must then give the mean curve of changes in prices and examine its effect on these results. The writer accordingly calculates, with the help of a scheme of the distribution of expenses and gross returns, the amounts of the single items in the various kinds of production in the average of the years 1908 and 1910 and 1911 up to the month of April; in his comparative calculation he reaches the following conclusions: The changes in the cost of production caused by the changes in the prices of the various products in the years 1910-11 were generally favourable for the farms. For the farms without any changes of prices were some more unfavourable. The writer's proposal is that the farms should consider the possibility of applying the so longer in a privileged position. The writer's proposal is that the farms should previously have been a few years in the position of the farms which apply the breeding fallow.

Lastly an appendix of 123 pages contains in the form of tables individual results of these calculations of the cost of production for years 1905 to 1909 for the farms connected with the book-keeping office of the Swiss Peasants' Secretariat.

The Over-Valuation of Estates. — BECK, ERNST in *Monatshefte für Landwirtschaft*, Year 6, Part 5, pp. 129-133. Vienna, May 1913.

The first reason of the rapid increase of the value of land is, according to the writer, the fact that farmers at present are able to compare all the producing centres of the world as to their produce and its valuation and thus form a better judgment on the value of land.

The second reason is in the improvement in the economic power of the tenant farmers, who, thanks to the use of abundant capital, have raised the productivity of the soil and consequently enhanced its value immensely.

Still a third reason of the over-valuation of land is that generally the returns from an estate are considered as returns given by the land, thus as a measure of its value, while the interest of the working capital should be deducted from the total returns before calculating the capital value of the land.

Under the term working capital as distinguished from landed capital, the writer defines everything that can be separated from the estate and which is passing over the farm to the lessee remains moveable property of the lessee.

On the other hand all improvements of the land itself, plantations, orchards, vines, hops, osier beds, etc., as well as permanent buildings, belong to landed capital. Only the interest returned by the latter, thus the rental value, represents the returns of the soil and is to be taken as basis for the calculation of the purchase price, taking the rate of interest in the district for safe securities.

The fourth and most important factor for the valuation of land is therefore the rate of interest: to the same extent that this sinks, does the purchase price of land rise; and as until quite recently the rate of interest has been sinking while the number of inhabitants has increased and the means of communication have improved, the higher valuation of land is easily understood.

But in order to obtain the real returns of the land, which are to be capitalized, it behoves to deduct from the total net revenue that portion due to the capital and agricultural capacity. It is only by keeping the installed capital and the working capital rigorously separated from each other that the difficulties encountered in the correct valuation of these elements can be overcome. Any attempt to establish the value of the returns according to the fertility of the soil (Bonität) without taking into account the varying influence of the capital employed on the land and its natural productivity suggests that the principles of valuation should be based on the cut-off of large estates and the small ones. For this purpose the year 1913 is suggested as a basis for 14

856 - **The Form of Wages of Permanent Farm-Hands in Trans-Danubian Hungary** (1). — WASS, RUDOLF in *Mitteilungen der landwirtschaftlichen Lehranstalt der K. K. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 591-625. Vienna, May 8, 1913.

The writer gives a brief review of the historical development of agricultural labour in Hungary and of the forms of wages, especially of the payments in cash and in kind. He then shows by means of tables and diagrams the nature of the wages of labour during the last ten years in the counties of Trans-Danubian Hungary, and the ratio between payments in cash and in kind, and gives a description of the latter. The total wages have risen considerably during the last ten years and the proportion of payments in cash to the total has constantly increased.

According to the writer it would be a great mistake in that part of the country to resort to only cash wages, for on the one hand it would lead to the ruin of the labourers owing to their want of economic preparation for such a step and on the other hand, it would be too heavy a burden for the conditions of credit of the farmers. The partial payment in kind should be kept up but it should be connected with an organization that would stimulate the labourers to become thrifty and give them the opportunity of investing their savings in such a manner as to get interest on them: in certain cases to use them as a source of credit.

The chief items of payments in kind are: wheat, milk and the keep of live stock, the use of fields and gardens, dwelling-houses and fuel. Wages in kind that are not consumed or are saved by the labourers should be bought back by the estates at prices which should be fixed from time to time, and the proceeds together with any increase for number of years' service, prizes, gifts and the like should be invested in some public bank (Raiffeisen for instance) so as to bring in interest.

In this manner the labourer could, on reaching a certain age, become the owner of some fields or at least get the lease of them for as long as he lived, which would lead to a home colonisation, that, with the further assistance of the State, would create and maintain a superior and settled class of agricultural labourers.

857 - **Three Years of Dairy Farming. The Variations in the Results and Their Causes.** — ORRIS, D. H. in *Hoard's Dairyman*, Vol. 45, No. 9, pp. 347-348. Atkinson, Wisconsin, March 28, 1913.

The writer deals carefully with the variations in the expenditure: returns of the farming years 1909-1910, 1910-1911 and 1911-1912, and differences thereby shown in the cooperativeness of the undertaking.

Results	1911-12	1910-11
Net returns	\$ 2 885.89	\$ 1 944.98
From this		
Interest	\$ 20	1 637.43
Profit remaining	\$ 307.43	

(1) Under which is bound the South by

The sudden fall in the profits in the last year is in the opinion of the due to increased capitalization and working expenses.

A Comparison Between a General Farm and a Dairy Farm. — OTIS, D. H. *Board's Dairyman*, Vol. 45, No. 7, pp. 259 and 270. Fort Atkinson, Wisconsin, April 14, 1913.

The first is a general farm with grade Shorthorns and grade hogs and compared with a dairy farm keeping grade Guernseys and pure-bred

The comparison shows that the net returns in the case of the dairy farm were much below the normal interest on the capital invested, the dairy farm, in spite of higher expenses and less outlay of capital, much more paying. The writer ascribes this fact partly to the difference of the products of the two farms, and partly to the difference in management.

Farming Eight-hundred-Dollar Land at a Profit. — DACY, GEORGE H. in *Successful Farming*, Vol. 12, No. 3, pp. 54 and 58. Des Moines, Iowa, March 1913. A description of an estate of 400 acres worth \$ 800 per acre and the manner in which it was farmed. Owing to intensive and skilful cattle and pig raising the yearly profit is 4 per cent. on the total capital expended.

The Importance of Public Valuation Offices for Estates and Farms. — ZIEHSEL, WALTER in *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 13, pp. 102-106 and No. 16, pp. 110-111. Berlin, April 14 and 21, 1913.

The importance of the correct valuation of landed property according to its use-tax and ground-tax, or the total value.

alterations and adaptations to present requirements. The organization and work of the projected valuation offices: local valuation offices, district office; drawing up and making valuation tables (« Tax rahmen ») and sale prices of estates. Advantages of these measures for the reform of laws of expropriation, for the alteration of the principles of legal taxation for the science of agricultural practice, for agricultural statistics and practical estate management.

AGRICULTURAL INDUSTRIES.

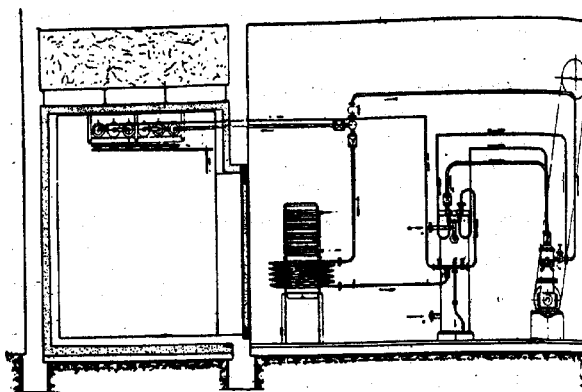
The Use of Cold in the Dairy. — RÜTERS, P. in *Zeitschrift für die gesamte Kälte-Industrie*, Year 20, Part 5, pp. 95-101. Munich, May 1913.

According to a lecture given by the writer at the Congress of the German Kälteverein (German Refrigerating Industry) the dairy industry can be divided into three groups, the first of which, to which dairies belong, comprises those dairies which produce almost exclusively only with the aid of cold, and which produce about 880 gallons of milk per day. The second group comprises those dairies which use cold only for the purpose of storing the milk, and the third group comprises those dairies which use cold for the purpose of producing ice cream. The second group is the most numerous, and the third group is the least numerous. In 1913, the milk produced by the dairies of the first group was 1,000,000 gallons, of the second group 1,000,000 gallons, and of the third group 1,000,000 gallons.

varies very considerably. Some deal with only 220 gallons a day, and attain 22 000 gals. The third group utilizes milk in various ways and possesses an industrial character.

As for the application of cold, it may be said that the cooling apparatus of the rural dairies are the easiest to handle and the cheapest. After cream has been warmed it is immediately cooled, mostly with well and brine to 2 to 4° C.

This cooling is done in the cream coolers at present used, namely vessels provided with cooling worm, cooling pipes or double sides, the



which cold water, sometimes brine, circulates. Frequently boxes filled with ice are suspended in the cream, or frozen milk is mixed with it.

For town dairies the refrigerating machine is a necessity. Direct evaporation in the milk cooler is preferred, as the action of the refrigerator is much greater than with the brine cooling.

The annexed figure shows an installation of this kind with direct evaporation in the milk cooler and with a system of cooling pipes.

In the third group of dairies, those that work up the milk industrially, cooling is so far important inasmuch as it allows the milk to be kept at low temperature until required for various processes to which it is subjected.

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The substances chosen were: 1) sodium sulphate, 2) magnesium sulphate, 3) rhubarb, 4) aloes, 5) arsenic; all of these are much used in every day treatment.

The bibliography of the subject does not include any treatise dealing with the question; the works of Malapert, Porcher and others of Labouret, Reveil, Fehling, Sigalas and Dupouy, Baum, Strumpel, Van Itallie, Nicloux, Oul, Fieux, Leclainche, Lewald, Hamier, Orfila, Falke, Simon, Marchand, Rombeau, Roseleur, etc.) mention possibility of certain drugs passing into the milk, but do not consider the effect in the percentage composition of the latter which may be due to agency. Such modifications, as is well known, depend not only upon chemical compounds, but also on many other factors: 1) breed, 2) age, 3) time of milking, 4) general conditions of living, 5) work, 6) pathological conditions, 7) physiological conditions (heat, gestation, castration), 8) mass of the udder (*mastagoga*), 9) feeding, 10) air, 11) individuality. All possible precautions were taken to eliminate the influence of these factors and to avoid any modifications due to the latter being attributed to the effect of the drugs.

Two samples of milk were taken from each cow, one before and the other after the administration of the medicine, and the differences due to the latter were noted. The cows which furnished the samples for analysis were kept in the shed and fed exclusively upon hay during the absorption of the drug and the period immediately following this. The second sample was taken 24 hours after the dose had been given. The purgatives (saline and castor) were administered once, while the arsenic was given in repeated and massive doses (from 80 mgr. to 1 gr.).

The results of these experiments, as regards the different components of milk, may be summarized in the following manner:

1) The *total solids* show an increase with the salts (+ 0.81 % with sodium sulphate; + 2.64 % with magnesium sulphate), while a diminution is observed with the drugs and arsenic (— 1.38 % with rhubarb, — 1.40 % with aloes, — 1.46 % with arsenic).

2. The *fat* undergoes the most marked alteration: with the salts it increases to a considerable extent (+ 0.94 % with sodium sulphate, + 2.05 % with magnesium sulphate), while it diminishes with the drugs and arsenic (— 0.80 % with rhubarb, — 0.14 % with aloes, — 0.26 % with arsenic).

3. The *casein* is the next most variable compound; it increases with the salts (+ 0.19 % with sodium sulphate, + 0.33 % with magnesium sulphate), it diminishes with the drugs and arsenic (— 0.14 % with rhubarb, — 0.14 % with aloes and — 0.14 % with arsenic).

4. The *albumen* present in milk increases with the salts (+ 0.10 % with sodium sulphate, + 0.10 % with magnesium sulphate), it diminishes with the drugs and arsenic (— 0.14 % with rhubarb, — 0.14 % with aloes and — 0.14 % with arsenic).

5. *Milk sugar* increases with the salts (+ 0.19 % with sodium sulphate, + 0.19 % with magnesium sulphate), it diminishes with the drugs and arsenic (— 0.26 % with rhubarb, — 0.26 % with aloes and — 0.26 % with arsenic).

6. The *lactose* present in milk increases with the salts (+ 0.19 % with sodium sulphate, + 0.19 % with magnesium sulphate), it diminishes with the drugs and arsenic (— 0.26 % with rhubarb, — 0.26 % with aloes and — 0.26 % with arsenic).

6. The ash constantly diminishes (-0.08% with sodium sulphate, -0.26% with magnesium sulphate, -0.13% with rhubarb, -0.09% with aloes, -0.08% with arsenic).

7 and 8. The density of the milk and of the milk serum show only slight variations; they are increased by the salts (density of milk: $+0.004$ with sodium sulphate, $+0.004$ with magnesium sulphate; density of serum: $+0.002$ with sodium sulphate, $+0.004$ with magnesium sulphate), but diminished by rhubarb and arsenic (density of milk: -0.002 with rhubarb, -0.004 with arsenic; density of serum: -0.002 with both rhubarb and arsenic); with aloes there is no change in either).

The writer comes to the following conclusions based on the above results:

1) It is very probable (leaving out of account the question of the passage of rhubarb, aloes and arsenic into the milk) that sodium and magnesium sulphates do not find their way into the milk (contrary to Malpas' statements).

2) The salts, rhubarb, aloes and arsenic actually produce considerable alterations (physiologically explicable) in the chemical composition, and thus affect the chief nutritive constituents of the milk.

3) This alteration may consist in the loss of all nutritive properties owing to the great decrease in the total solids, or it may be that the milk is unsuitable as a food (e. g. from an excess of casein rendering it indigestible); but in any case, being of pathological origin, such milk is unhygienic, and should not be sold except for special purposes and under the name of "medicinal milk". This last conclusion is the principal result of the experiment.

863 - Chemical Changes Produced in Cows' Milk by Pasteurization. — RICE, PAUL. U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin 166, pp. 1-10. Washington, April 22, 1913.

The writer mentions that one of the objections frequently raised against pasteurized milk is that the heating produces changes in the chemical composition which makes it unsuitable for infant nourishment. It is claimed that a portion of the soluble phosphate of lime becomes insoluble, and that this change produces defective nutrition, while the changes in the lactalbumin and in the casein render the pasteurized milk more indigestible than raw milk, and therefore inferior as a food.

The objects of the work described were to study the chemical changes produced in milk at the different temperatures used in commercial pasteurization, and to determine whether a temperature that destroys bacteria also produces changes in pasteurization with respect to the chemical composition of the milk.

The method employed was to take a sample of milk, having received no treatment, and place it in an Erlenmeyer flask closed with a stopper. The flask was then placed in a water bath, the water being at the desired temperature. The flask was removed from the water bath at intervals, and the milk was analyzed. The results of the analysis are given in the following table.

ght of the temperature. It was then allowed to remain for 30 minutes, or which it was rapidly cooled to about 53° F.

The writer studied separately and carefully the changes in the phosphates, in the proteins and in the acidity of the milk.

He gives the results obtained by other investigators and describes methods of filtration, analysis and coagulation (of the casein) employed in his researches.

His summary and conclusions are as follows :

- 1). Milk pasteurized by the "Holder" process at 145° F. for 30 minutes does not undergo any appreciable chemical change.
- 2). The soluble phosphates of lime and magnesia do not become insoluble. At 155° F. the quantity of phosphoric acid, lime, and magnesia in the serum of both raw and pasteurized milk is practically the same.
- 3). The albumin does not coagulate at 145° F., but at 150° F. 5.75 per cent. of the albumin is rendered insoluble. As the temperature increases amount of coagulated albumin increases. At 155° F. the quantity is 75 per cent. and at 160° F. it amounts to 30.78 per cent.
- 4). The time required for coagulating the casein by rennin is slightly in milk pasteurized at temperatures up to 149° F. than it is in raw milk. 158° F. there is a slight retardation, while at 167° F. the time is almost the same as great.
- 5). The acidity as determined by titration, is slightly diminished in pasteurized milk.

- **A Study of the Bacteria which Survive Pasteurization.** — AYERS, S. HENRY and JOHNSON, WILLIAM T. U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 161, 66 pp. Washington, March 11, 1913.

After a short introduction showing the importance of the investigation question and giving the results of previous experiments on the subject, the writers treat of the general and special object of their investigations and describe their methods of work.

Having collected information respecting the methods of pasteurization employed in the United States, the writers examined the bacterial results. They studied the quantitative reduction in the bacterial flora in connection with the temperature and the duration of the process, the effect of low temperatures on pasteurized milk, the nature and products of the living bacteria, both from a quantitative and qualitative point of view, the bacterial temperatures for each of the principal groups of bacteria, etc.

The experiments were carried out in such a manner as to preclude any reinfection of the milk by bacteria which had survived pasteurization. The results show that bacteria are not destroyed at the given temperatures.

In the great majority of cases, bacteria which had survived pasteurization at 145° F. for 30 minutes were found to be viable at 155° F. for 30 minutes. The United States Department of Agriculture, Bureau of Animal Industry, Bulletin No. 161, 66 pp. Washington, March 11, 1913.

Raw milk contains four chief groups of bacteria: the acid, inert, al and peptonizing groups. The acid group is divided into two sub-groups: the acid-coagulating, which coagulates milk in less than 14 days, and acid group, which merely produces acid and does not coagulate milk within 14 days. In raw milk the inert group is the largest. In milk pasteurized at 145° F. the great increase in the proportion of the acid-coagulating acid group is plainly shown. The percentages of the alkali and peptonizing groups are reduced. At 160° F. the total acid group is still the largest, the acid-coagulating sub-group is made up of bacteria which coagulate slowly. At this temperature the alkali group is greatly reduced and peptonizing is reduced to a minimum. At 170° F. the total acid group remains about the same, but the organisms produce acid and coagulate slowly. The alkali group is practically destroyed, although occasional sample may show a fairly high percentage. At this temperature the percentage of the peptonizing group to the total bacteria begins to increase. At 180° F. the increase when milk is pasteurized at 180° F. is even more striking. 75 per cent. of the bacteria which survive being peptonizers. None of the acid-coagulating group are found and only a small percentage of the acid group, while occasionally a few of the alkali group occur. The proportions are maintained almost constant with temperatures of 190 and 200 F.

The bacterial flora of pasteurized milk thus depends chiefly on the temperature of the process, and the figures given by the writers summarize in a general way the most important results of their investigation.

865 - A Comparative Investigation of the Digestibility of the Protein of Milk and of Milk Desiccated at High Temperatures. — AVIRAGNET, D. LENCOURT, and BLOCH-MICHEL in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 74, No. 15, pp. 885-887. Paris, May 2, 1913.

The digestion experiments with desiccated milk were carried out by the writers in the following manner: The milk powder was first dissolved in tepid water, after which the total nitrogen content of the solution was determined. To every 100 cc. of this solution were added 50 cc. of liquid trypsin (trypsin in chloroform water) and the mixture was equally divided between 10 Erlenmeyer flasks. The writers investigated one flask at once to ascertain the amount of diamide (NH_2) liberated by the commencement of the digestive process; the other nine were placed in a water bath at 37° C., after their contents had been made strongly and equally alkaline by the addition of sodium carbonate.

One flask was removed at every half hour for the determination of the diamide.

The investigators found that the digestibility of milk protein was carried out in the same manner as that of casein, and that the digestibility was the same for both.

From the results of the experiments, the writers conclude that the digestibility of milk protein is not affected by the desiccation process, although the desiccation process does not affect the digestibility of milk protein.

rence is, in the writers' opinion, to be attributed to a molecular change to the desiccation process.

The Effect of the Salts of the Rare Earths upon the Coagulation of Milk by Rennet. — FROUIN, ALBERT and MERCIER, VICTOR in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 17, pp. 990-991. Paris, May 16, 1913.

In this experiment 10 cc. of milk were placed in each of a number of vessels with different amounts (0.1 to 1.8 cc.) of a 1 per cent. sulphate and kept during 10 minutes at a temperature of 38 to 40° C.; to each was added the same amount of rennet, and all of them, together with controls, were placed in a thermostat for coagulation. The effects of the sulphates upon this process are shown by the following tables (which are judged).

Content of phosphate in milk	Number of minutes required for coagulation with :					
	Cerium Sulphate	Lanthanum Sulphate	Neodymium Sulphate	Praseodymium Sulphate	Samarium Sulphate	Thorium Sulphate
0.1	20	19	16	18	19	17
0.2	*19	18	16	17	18	15
0.5	14	15	14	14	14	12
1.0	9	11	10	10	10	9
1.4	7	9	7	8	8	8
1.8	5	7	6	6	7	6
Coagulation time of control milk:						
	21	21	19	21	21	19

This table also shows that the sulphates of the rare earths hasten coagulation. According to previous experiments of the writers, the acids have the same effect.

The Manufacture of Cheese

by L. and BRUN, A. T. — *The Journal of the Dairy Experiment Station*, Research Bulletin No. 27, 28.

The continued improvement in the economical production of cheese calls for the use of well-equipped factories. This is especially true in the case of the only supply of cheese-making factories in the United States, which is the only one that can be brought in.

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story, and be made up into cheese in a uniform, routine manner, without variations of time or method of handling. The new method should produce cheese of greater uniformity and avoid the present common loss in yield and quality due to defective milk.

During the years 1905-1906, experimental cheese was made, omitting the starter, and in its place, adding various commercial acids to the milk. The method of adding acid to milk was perfected, and a two-week trial of the process was finally made in a commercial factory at Muskegon, Wis. It was shown that the addition of hydrochloric acid to milk is entirely practicable at cheese factories, and that the quality of the cheese was not in any way injured by such an addition; but it was also found that the quality of cheese obtained from over-ripe or tainted milk was no better than by the use of the ordinary factory methods. Therefore there was no reason for recommending the use of hydrochloric acid to cheesemakers at this time.

Most of the defects observed in cheese factory milk are of bacterial origin. In other branches of the dairy industry, pasteurization is successfully employed to overcome these faults. In 1907, a few lots of milk were pasteurized in a discontinuous pasteurizer, and then acidulated with hydrochloric acid, and the cheeses obtained were such as to demonstrate the importance of further study.

In 1908, equally good results were obtained by use of the continuous pasteurizer. Heating to 160° to 165° F. was found sufficient to check effective bacterial action in milk for cheese-making purposes. Bacterial counts show that over 99 per cent. of the total bacterial content of the milk was destroyed at this temperature. The use of higher temperatures was shown to be objectionable, on account of the effect on the quality of the cheese.

In 1909, cheeses were made almost daily both by the regular factory process, and by the new process from pasteurized milk. The regular supply was thoroughly mixed each day and divided into two lots, for the two processes. After curing, the cheeses made from pasteurized milk were found to be cleaner in flavour than the raw milk cheese and superior in texture. The difference was more marked the poorer the quality of the milk supply. Many of the details of the process were studied and improved.

In 1910, the making of cheese by the two methods, for comparison, continued, and the entire output of pasteurized milk cheese was sold to retail grocers, mostly in the city of Madison, to determine how these cheeses would suit the trade. The sale was ready and continued sale. It was noticed that the pasteurized cheese was generally somewhat greater by new process than the regular process.

In 1911, weighing large quantities of milk and cream, and from raw milk, and of cheese from raw milk; so milk cheese drippings



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the weight of the cheese, or less than half of the usual loss in handling milk.

In addition to this saving of fat, it is found that a somewhat larger portion of moisture is incorporated in pasteurized milk cheese than in many cheese, without damage to the quality. The gain in yield of sterilized milk cheese is therefore due partly to fat and partly to moisture.

Scores and criticisms given by competent cheese judges show that pasteurized milk varied less in quality and averaged better by 3.7 points total score, than the raw milk cheese made from portions of the same milk supply. The pasteurized milk cheese scored higher than the raw milk cheese in 96 per cent of all cases.

Since pasteurized milk cheeses can be cured without injury at 70° F., likely that in many cases the expense of cold storage for these cheeses be avoided. Pasteurized milk cheeses can be put into cold storage at 70° F. at the age of one week, and possibly earlier, without injury. The earlier they can be put in storage, if this is done at all, the greater will be gain in yield by the process. It is planned to study the cold storage of these cheeses further.

During 1910-1911 about 2100 dollar's worth of pasteurized milk cheese was sold to about fifty dealers, both wholesale and retail, in various cities, from New York to San Francisco. The cheese sold readily for ruling market prices and often above. Very few dealers offered any objection to them, and several wished to buy them regularly. In general, cheeses passed the market without exciting special comment, selling full price, and giving satisfaction. There appears to be no reason why sterilized milk cheese cannot be sold regularly in any market, with the same satisfaction, excepting possibly to the limited trade that demands high-flavoured cheese.

In the method described by the writers, a principle is applied to cheese-making which has been found useful in many other lines of manufacture: raw material, milk, is first treated by a preliminary process to bring it to uniform condition before it enters the manufacturing process proper. Material of uniform quality, thus prepared, is made up into the finished product by a uniform routine process, and the product is more uniform in quality, has better keeping qualities, etc., than the product obtained by the older process.

The difficulties met hitherto in producing American Cheddar cheese from sterilized milk are (1) that the curd is obtained poorly with rennet, (2) the curd when obtained is not as firm as that from raw milk. It does, this effect being due to the fact that the temperature of sterilization is higher than that of the curd. The curd suggest that it lacks the firmness of the curd obtained from raw milk. The first of these difficulties has been overcome by the method described in this paper. The second difficulty has been overcome by the method described in this paper. 1913.

which is added a lactic ferment cultivated according to special rules pasteurized skimmed milk. Before the rennet is introduced a second amount of the pure culture is added, and the cheeses are sprinkled with dry culture when in the ripening room.

The von Mazé system differs from the method usually employed in making soft cheeses, in that it always ensures a normal ripening. The writer has investigated the process and made Camembert cheese both according to the von Mazé method and according to the ordinary methods, showing thereby that there were no differences in the two kinds of cheese, except the involved in the actual manipulation. In both cases the coagulation was normal, but in that of cheeses made after the von Mazé method, the whey appeared to separate more quickly. The amount of curd was the same, but the writer noticed that cheeses made according to the usual method ripened somewhat sooner. Only in two out of five times did the cheeses prepared by the von Mazé system show any superiority in flavour. It would thus appear that this method does not present any special advantages over that usually adopted in making Camembert cheese.

870 - **The Reorganization of the Cattle and Meat Trade in France.** - *L'Annuaire de la Science agronomique*, Year 30, No. 4, pp. 241-266. Paris, April 1913.

The writer first investigates the amount of the annual meat production in France and the consumption of meat in that country (1). The results are given in tabular form and according to them 20 296 394 cwt. of beef are supplied annually for home use, 3 848 638 cwt. of mutton, and 17 024 4 cwt. of pork. If to the imported meat is added also the rabbits, game, goats, horseflesh, and the amount exported subtracted, the annual consumption per head of the population is about 132 lbs.

In the following section, the writer investigates in how many of the Departments the supply meets the demand; which export and which import cattle for the butcher, and how many of such cattle are exchanged between the different Departments: Of the total number, in six the supply just meets the demand, in 50 there is a surplus, and 31 import beef; while the trade between the different Departments accounts for 550 000 head of cattle, 45 Departments import sheep, 42 export them, and 4 400 000 sheep (including 2 million lambs) are exchanged. In 42 Departments the supply of pigs exceeds the demand, and 2 200 000 head of these animals are annually sent to the market.

Those Departments which produce more meat than they require are chiefly situated in Central France. The Northern, Eastern, and Southern Departments of the Gironde, import cattle; some of the districts (Morbihan) export cattle regularly throughout the year, and are supplied by the provinces of the west to Paris, and 1/2 to the Villette market, and 1/2 to the Parisian markets.

ket are again despatched from Paris and sent either abroad, or back to the provinces.

Paris is therefore the great centre of the cattle and meat trade in France, though there is a certain amount of trade in the provinces; the price of live cattle, moreover, is fixed at the La Villette market.

The prices at the latter, however, are not always regulated by supply and demand, but are liable to manipulation, and as an unexpected fall in prices at La Villette affects the trade of the whole country, the unreliability of the market quotations is a serious disadvantage. The whole trade is so attended with great expenditure, and entails the risk of spreading disease.

The writer is therefore of opinion that the cattle and meat trade should be centralized. This could be effected by building local abattoirs with adjoining markets in the centres of production, the cost of the erection and maintenance being partially defrayed by the local government.

The Ferment Producing Bitterness in Wines. — VOISNET, E. *Nouvelles recherches sur un ferment des vins amers.* — Le ferment de l'amertume des vins constitue-t-il la crème de tartre? — *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, Nos. 15 and 18, pp. 1181-1182 and 1410-1412, Paris, April 14 and May 5, 1913.

In his preceding communications (1) the writer demonstrated that bitterness is formed in the disease of bitterness in wines, and also shewed that a pure species of the ferment taken from a bitter wine, and cultivated in the presence of glycerine, rapidly gives rise to acrolein and produces a bitter

on pursuing this investigation, the writer found that this ferment, having been sown 15 months previously in different sterilized wines, whether in their natural state or partially deprived of their alcohol, developed in some cases quite rapidly and exhibited all the morphological characters of the bitter wine ferment. All the samples in which growth had taken place contained acrolein; the amount of fixed and of volatile acids increased; the colouring matter was partly altered and precipitated, and some of the wines had a more or less pronounced bitter flavour. The bacillus, called by the writer *Bacillus amaracrylus*, is therefore selected to produce the bitter disease of wines, with its organoleptic, microscopic and chemical characters.

Amongst other fermentable substances it reacts on glycerine, transforming it partly into acrolein, and a small amount of volatile aldehyde, which undergoes various metamorphoses. Other products are formed, among which carbon dioxide, hydrogen, formic, acetic, and lactic acids, formic, acetic, and acrylic, as well as acrolein, and at about the same time, which appears to be a mixture of lactic acids, lactic acid, and succinic. This ferment, when produced in the presence of glycerine, it has

a moderate action on dextrin, and does not ferment erythrite, dulcitol, starch. The fermentation of the sugars, saccharose, lactose, maltose, glucose, levulose and galactose, is complete in the presence of calcium carbonate. Saccharoses do not appear to be previously reduced by the ferment; above all throughout the whole process of fermentation the carmes solution does not reduce Fehling's solution.

Amongst the transformation products of mannite and of the sugar alcohols are found those yielded by glycerine, with the exception of acrolein and its derivatives.

Bacillus amaracrylus seems to be inactive as regards tartaric acid and its salts, especially cream of tartar.

PLANT DISEASES

GENERAL INFORMATION.

The Law of April 1329 (1312) Regarding Agricultural Pests in the Ottoman Empire. — *Journal Officiel de l'Empire Ottoman et Archives du Ministère de l'Agriculture*, April 15, 1913.

Art. 1. — Any person in a district observing injuries caused to plants by diseases or noxious insects, or by any other cause, known or unknown, is required to at once give notice to the local authorities, who determine the nature of the injuries and take measures as follows:

Art. 2. — The nature of all plant diseases, as well of insects and other parasites which are harmful to cereal crops, plantations, and plants in general, are to be determined, together with the date of the attack, its importance, the district invaded and the kinds of plants affected. The measures to be adopted, and the time of their application, will be decided by the technical expert, who will present his report to the Vali (Governor-General of the Vilayet), to the Mutesarif (sub-Governor) or to the Kaimakam (Governor of the district). These will, in a suitable manner, acquaint those interested of the fact of the existence and of the nature of the diseases.

Art. 3. — Immediately upon receiving the information from the local authorities mentioned in Art. 2, landowners, farmers and all other persons enjoying the rights of pasturage and of communal forests are required to carry out the measures ordered by the Governmental authority. The control of the strict application of the methods enjoined is in the hands of the technical experts, who are not to be hindered in the discharge of their duties.

Art. 4. — If the injuries occur on an area which is the property of the Vilayet, or on Vacuf land (land bequeathed to the church) or on State land, the necessary measures are at once carried out by the government of the Vilayet, the administration of the property being directly by the State.

Art. 5. — Such persons who do not carry out the measures decreed, or carry them out in an unsuitable manner, shall be liable to a fine of from half a pound to two pounds.

Art. 6. — In case of a serious pest, the Government may inform the landowners of the nature of the insects. Such persons as do not carry out the measures decreed shall be liable to a fine of from half a pound to two pounds.

Art. 7. — If the measures enjoined are not carried out by the persons interested within the term fixed by the Government, the local authorities, viz. the Vali, the Mutesarifs, the Kaimakams, and the Director of the Commune, can severally form a Commission presided over by themselves, and consisting of a member of their own administrative council, of an agriculturist and a technical expert, who, after estimating the necessary expenses, will take the necessary measures, of which the expenses will be chargeable to the extraordinary budget of the Vilayet.

During the harvest, the sum expended will be collected with interest according to the law of collection, by the collectors of the Ministry of Finance, and the money deposited in the local bank.

Art. 8. — The measures and the remedies prescribed shall be applied under the direction of the technical expert, and the outlay approved by the committee.

Art. 9. — The fines mentioned in the preceding article are collected in the Vilayets, Livas and Cazas by the competent council, and in the Communes according to special arrangement by the Communal Council without having recourse to the courts of Appeal and Cassation.

Art. 10. — In case of refusal of payment of the adjudged fine, the competent Council, or the Communal Council, draws up a statement which is sent to the highest civil officer of the place; he reports to the examining magistrate. The examining magistrate, according to Art. 37 of the Penal Code may substitute immediate imprisonment for the fine.

Art. II — The ministries of the Interior, of Justice, of Commerce, and of Agriculture are charged with the carrying into effect of this law.

Art. 12 — This law comes into force on the date of its publication

873 - Decree for the Protection of the French Colonies and Protectorates from the Propagation of Plant Diseases. — *Journal Officiel de la République française* Year 45, No. 148, p. 4128. Paris, May 12-14, 1913.

Under date of May 6, 1913, the President of the French Republic decreed as follows :

Art. 1. — In view of hindering the propagation of plant diseases due to parasitic animals and plants or to worms or to non-parasitic insects, the Colonial Minister may by special orders, setting forth the disease and the plants susceptible to its attack, forbid the following articles being imported into colonies, or protectorates, other than Algeria, Tunisia and Morocco :

- 1) Plants subjected to treatment with insecticides might be transported.
- 2) All other plants might be transported.
- 3) Soil of plants subjected to treatment with insecticides might be transported.

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ing materials which have served in the transport of the prohibited plants, soil and composts.

Art. 2. — In default of any existing prohibition by virtue of the preceding article, the Colonial Minister can, by special decree, determine the conditions of the entrance and circulation in the Colonies and Protectorates of the plants and objects mentioned in the said article. He also fixes the conditions under which the branches, leaves, fruits and débris of the said plants may enter and circulate in the colonies and Protectorates.

Art. 3. — Any person infringing the measures of the Colonial Minister regarding the execution of the first and second articles of the present decree is liable to a fine of from 50 to 500 francs (£ 2 to £ 20).

Art. 4. — Persons who, by means of any fraudulent device, shall introduce into the Colonies or Protectorates dependent on the Colonial Office plants or articles of which the introduction has been prohibited by the Colonial Minister, in accordance with art. 1. of the present decree, are liable to a term of imprisonment varying from one to fifteen months and a fine from 50 to 500 francs, or to one of these penalties singly.

Art. 5. — The penalties set forth in the two preceding articles are doubled in the case of a second offence. The offence is regarded as a second offence if, during the twelve preceding months, a first sentence has been passed upon an offender according to the present decree.

Art. 6. — If extenuating circumstances can be proved, the courts are empowered, even in the case of a second offence, to reduce the term of imprisonment to less than one month and the fine to below 50 francs, provided penalties are not made less than the simple police fine.

Art. 7. — The decree of July 26, 1911 (1), is abrogated.

Art. 8. — The Colonial Minister and the Keeper of the Seals, Minister of Justice, are charged, each according to his powers, with the execution of the present decree, which will be published in the *Journal officiel* of the French Republic and inserted in the *Bulletin des Lois* and the *Bulletin officiel* of the Colonial Ministry.

Proclamation on Plant Protection in Nyassaland. — The Plant Protection Ordinance, 1912. Proclamation. No. 8 of 1912. — *The Nyassaland Government Gazette*, 1912, Vol. XX, No. 1, pp. 3-4. Zomba, Jan. 31, 1913.

Whereas by Section 3 of "The Plants Protection Ordinance, 1912," provided that the Governor in Council may by Proclamation to be published in the *Gazette* absolutely or conditionally prohibit the importation directly or indirectly from any place named in such Proclamation of any plant or any article packed therewith in any package or other article of the Governor in Council is likely to introduce the disease into the Protectorate.

And whereas

of cotton plants with the following exceptions should be absolutely prohibited :

Exceptions :

- 1) Cotton plants grown in Egypt.
- 2) Cotton plants imported for experimental purposes by the Director of Agriculture and packed in double bags or tins.

And Whereas it has been further made to appear to me that all plants permitted to be imported should be imported subject to certain conditions.

Now therefore by virtue of the powers in me as Acting Governor Council vested as aforesaid I DO HEREBY declare and proclaim that the importation of cotton plants with the exceptions as aforesaid shall be and HEREBY absolutely prohibited.

And Further that the importation of all plants permitted to be imported shall be imported subject to the following conditions :

1. Every package containing plants imported into the Protectorate through the medium of the Post shall contain a statement containing full names of the kind and variety, the country of origin, and the name and address of the person or firm supplying such plants together with any certificate which may be prescribed by Schedules A or B. Such package shall be delivered by the Postal Department to the Agricultural Department Zomba, for inspection, and disinfection, if necessary. Such package shall if in order, be delivered to the Post Office to be forwarded to the addressee without further postal charge. Any package of plants which does not contain the requisite statement and certificate shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine.

2. When plants are intended to be imported otherwise than through the medium of the Post, a statement containing the full names and the kind and variety, the country of origin and the name and address of the person or firm supplying such plants together with any certificate which may be prescribed by Schedules A or B shall be posted to the Comptroller of Customs. Such statement and certificate shall be despatched by the consigner in sufficient time to enable it to reach the Comptroller of Customs one month in advance of the consignment. Plants which reach the Port of Entry, for which the necessary statement and certificate have not been received, shall be detained, pending the receipt of the statement and certificate as aforesaid, and if such are not received within one month subsequent to the arrival of the plants the whole consignment shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine. When plants are imported by persons entering the Protectorate, the statement and certificate shall be produced to the Customs Office giving the information required by the statement and certificate which may be prescribed by Schedules A or B. The statement and certificate shall be considered necessary by the Comptroller of Customs and if considered necessary by the Comptroller of Customs the consigner shall be allowed to proceed. If the statement and certificate are not produced or are incorrect, the whole consignment shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine.

3. All plants shall be securely packed and should any package be so damaged in the course of transit as to render it possible that any plant may escape therefrom, such package and any plant therein or thereon, may at the discretion of the Agricultural Authority be confiscated. The following Proclamations are revoked :

Proclamation contained in *Gazette Notice No. 49 of 1909.*

Proclamation contained in *Gazette Notice No. 79 of 1909.*

Proclamation contained in *Gazette Notice No. 131 of 1909.*

SCHEDULE A.

The importation of plants of the following kinds shall be accompanied certificate from the official Agricultural Authority of the countries from which the plants originated to the effect that they have been grown in areas known to be free from diseases or pests which characteristically attack such plants :

Rubber of all varieties	} from all countries.
Cacao	
Cocoanuts	
Rice	
Tobacco	
Potatoes	

SCHEDULE B.

The importation of plants of the following kinds shall be subject to permission of the Agricultural Authority being first had and obtained.

Coffee	} from all countries.
Tea	

Regulations on Cotton Growing in Nyasaland. — The Cotton Ordinance, 1910. Rules. *The Nyasaland Government Gazette*, 287: Vol. XX, No. 1, pp. 5-6. Zomba, in. 31, 1913.

1. Every landowner and person planting cotton in the Protectorate uproot and burn all cotton bushes on his land or planted by him before the first day of October next following the date of planting of such bushes. This Rule shall not apply to the Lower Shire, Ruvo and West Districts.

2. Every landowner and person planting cotton in the Lower Shire, and West Shire Districts shall uproot and burn all cotton bushes on his land or planted by him in the Protectorate before the first day of December next following the date of planting of such bushes.

3. Any bushes not uprooted and burned in accordance with these Rules shall be uprooted and burned by the District Resident or by a person appointed by him. The person who fails to do so shall be liable for the expense of such work and for the loss of this year's crop to their satisfaction.

Cotton to be ginned in the Protectorate. — 4. All native grown cotton produced up Crown lands from seed issued by Government shall be ginned in the Protectorate.

Reservation of seed to Government. — 5. All cotton seed issued by Government to natives is issued subject to the condition that Government retains the right to any seed obtained from the crop which is the produce of the seed issued. Every licensee purchasing native grown cotton produced up Crown lands from seed issued by Government, before selling, giving or otherwise disposing of such seed after ginning shall obtain a certificate from the Director of Agriculture that such seed is not required by Government, and if the Director of Agriculture shall intimate that such seed or any part thereof is required by Government the licensee shall dispose of the quantity specified at the disposal of Government.

Approval of Director of Agriculture. — 6. No cotton seed shall be issued to natives until it has been approved by the Director of Agriculture.

Authority for distribution of seed. — 7. No person except a person authorized by the Governor, shall distribute seed to natives for cultivation on Crown lands. Applications for such authority shall be made in the first instance to the Director of Agriculture.

Licence to purchase. — 8. No person shall purchase native grown cotton being the production of seed distributed for cultivation on Crown lands unless he shall previously have been licensed so to do under these Rules.

Form of licence. — 9. A licence shall be in the form prescribed by the Governor and shall expire on the thirty-first day of March next following the date of issue. Every such licence shall be obtainable from the District Resident of the District in which the purchase is to be made.

Duty of licence. — 10. The duty chargeable on a licence shall be ten shillings.

Place of purchase. — 11. No licence shall authorize a licensee to purchase native grown cotton in a place other than the place stated in the licence.

Establishment of markets. — 12. For the purpose of the sale of native grown cotton, markets shall be established by Government in native or growing districts.

Market tolls. — 13. Purchasers of native grown cotton shall pay market tolls at the rate of 3 d. per cwt. of seed cotton purchased. Such tolls shall be paid to the District Resident of the District to which his licence applies concurrently with the submission of the monthly return referred to in Rule 14 hereof.

Monthly returns. — 14. Every licensee shall on the last day of each month make a return of the quantity of the District to which his licence applies. The return shall be made in the form prescribed by the Governor and shall be submitted to the District Resident of the District to which his licence applies. The licensee shall also submit a statement of the price which he paid for the cotton purchased.

Inspection. — 15. The District Resident of the District to which the licensee's licence applies shall inspect the seed cotton produced up Crown lands from seed issued by Government, and shall certify to the Director of Agriculture the quantity of seed cotton produced up Crown lands from seed issued by Government, and shall certify to the Director of Agriculture the quantity of seed cotton produced up Crown lands from seed issued by Government, and shall certify to the Director of Agriculture the quantity of seed cotton produced up Crown lands from seed issued by Government.

Amongst the external causes which may provoke alteration in the stigmatic papillae and bring about their death, are rain and mist, both of which act by wetting the stigma.

The death of the stigmatic papillae is due to the arrest, or excessive reduction, of the activity of the functions of respiration, transpiration, assimilation. These conditions bring about an accumulation of acid exceeding the amount which can be tolerated by the protoplasm.

BACTERIAL AND FUNGOID DISEASES.

877 - Work of the Laboratory for Botanical Research and Plant Diseases at the Royal Imperial Institute of Vine and Fruit Cultivation at Klosterneuburg, Austria. — Communicated by Prof. L. LINSBAUER to the International Institute of Agriculture.

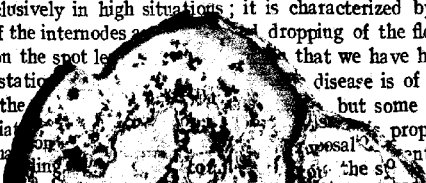
One of the principal aims of the Laboratory has been to study plant diseases not only with reference to parasites, but specially on the line of investigation of the physiology of disease; its work should therefore be judged from this point of view.

In this paper a short description is given of some of these physiological investigations, which naturally extend over a considerable period of time, and as many of them are still incomplete, the following lines should be regarded in the light of a programme.

Pseudoperiza tracheiphila (« Rote Brenner ») was observed in dryness on European vines and also on American vines and on hybrid vines occurred in the typical form, fungus mycelium being in all cases present. The following varieties of vines were attacked: Berlandieri, Monticola, Riparia Portalis, Solonis, Riparia X Rupestris, Mourvèdre-Rupestris, Gouais, Schwarzmann-hybrid.

Cuttings of vines affected by this disease were grown under glass, kept as dry as possible in order to determine whether the infection can be conveyed to cuttings by the mycelium entering the stem of the vine, in spite of cultivation for several years in dry air, without dew or rain, and with the scantiest watering, only a single spot due to the fungus was seen. The occurrence of the latter is therefore due in every case to reinfection.

The « Droah » (1) is a vine disease occurring in Lower Austria and most exclusively in high situations; it is characterized by hindering the growth of the internodes and by the dropping of the flowers. Investigations on the spot lead to the conclusion that we have here to do with a manifestation of the same disease which is of great interest because the intermediate stage between the two diseases is of great interest. It is proposed to obtain similar changes in the same way as in the case of the « Droah ».



Further, the disease has suggested the study of desiccation phenomena. These investigations are at present not concluded. A few preliminary observations suggest that vines only shoot when their water content has a fixed average (in a preliminary series of experiments between 31.39 per cent.), while with a higher or lower water content no shoots are issued. Whether "Droah" symptoms can be artificially produced by a lack of water is at present unknown. The relation between "Droah" and the leaf-curl ("Kräuselkrankheit") due to mites has yet to be ascertained.

Another problem is afforded by the diseases of grafts, which are chiefly connected with the question of wood ripeness. These maladies are to be made the subject of investigations, all the more because two points seem to have been shown by the discussion of the views hitherto obtaining regarding wood ripeness.

Firstly, the condition in which we find a so-called "ripe" shoot depends upon unknown causes, which are quite different from those giving rise to symptoms characteristic of ripe wood. Again while "ripeness of wood" is a useful, practical and pertinent expression, it does not convey a single word with sharply defined limits.

The question of the entry of the spores of *Plasmopara* into the leaves of a vine, which has lately been answered by Müller-Thurgau (1) in the manner we know, leads to a closer investigation of the foliage of trees regarding the opening and shutting of their stomata. Molisch's infiltration method could be used for this purpose.

Other questions of a purely physiological nature arise from these investigations, which we have cursorily described. They are all based upon the principle which we mentioned at first, viz. that the condition of a diseased vine can only be rationally judged when the physiological state of a healthy plant is taken as a basis for comparison.

A Contribution to the Mycological Flora of East Russia. — NAUMOFF, N. Travaux de l'Institut de Pathologie végétale de St.-Petersbourg. Matériaux pour la flore mycologique de la Russie. — *Bulletin trimestriel de la Société mycologique de France* vol. XXIX, Part 2, pp. 273-278, fig. XIII. Paris, 1913.

The writer is about to publish the complete list of species collected in Russia during the summer of 1912, and in the meantime, describes three following species, which he considers to be new to science: *Bremia vinicola*, on the living leaves; *Bremia ciliaris* Beauv.; *Cicinia brevipagrus*, the pyrenia were closely attached to the fruiting organs (conidia); *Rhizoglyphus* species; and *Rhizoglyphus ussuriensis*, which was found on a plum tree and was popularly as the

The writer, in his researches on the propagation of rusts in the neighbourhood of Lyons, has frequently recorded the presence of the resting or reproductive organs of these fungi (mycelium, uredospores and teliospores) inside the caryopses of cultivated Gramineae (wheat, oats, barley) or of wild species (*Bromus mollis*, *Brachypodium pinnatum*, *Agropyronum*, *A. repens*).

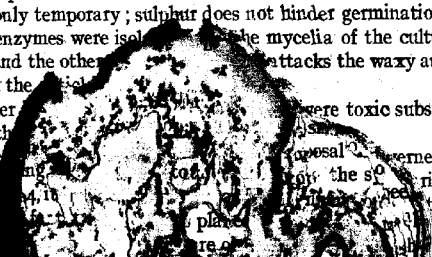
880 - **The Biology of *Cyloconium oleaginum*.** — PETRI, L. Studi sulla
lattice dell'olivo. III. Alcune ricerche sulla Biologia del *Cyloconium oleaginum*.
- Memorie della R. Stazione di Patologia vegetale, Roma, 196 pp., 37 figs. Rome,

The researches, partly carried out since 1905, have shown in the place that *Cycloconium* can be grown saprophytically. In cultures it chlamydospores and microsclerotia, and only on an acid substratum it give rise to conidia. A temperature of from 30° to 32° C. prevents germination of the latter and also hinders the development of the culture at the lowest temperature which permits of the germination of the conidia (2° C., but the mycelium is very resistant to cold (-15° C.)). Germination does not take place in water rendered alkaline by the addition of 1 per cent. of sodium carbonate or containing 3 per cent. of tartaric acid. Germination is also hindered by mercuric chloride at a concentration of 1:5000, by silver nitrate (1:35000), gold chloride (1:30000), copper sulphate (1:30000). The resistance to toxic action depends directly upon the resistance of the substances present in the conidia. The useful action of calcium phosphides is only temporary; sulphur does not hinder germination.

Two enzymes were isolated from the mycelia of the cultures, the one being a pectinase, and the other an esterase which attacks the waxy and fatty substances of the cell walls.

Neither were toxic substances d

The Commission's proposal is governed principally by the right of the State to regulate the external relations of its citizens. This characterizes the nature of the international relations of the State.



turn depend on pathological vegetative conditions. In the wild tree the slight development of the cuticularized layer, which in the mated variety is more or less rich in pectic substances, represents a tion of constitutional resistance which is capable of modification by s of cultivation. *Cycloconium* does not find conditions suitable for its opment on leaves which are about to fall. The nutrition of the interlar mycelium takes place at the expense of the cuticularized layers e membrane, and at that of the carbo-hydrates and soluble nitrogecompounds present in the epidermal cells. The germination of the conit low temperatures, and the physiological condition of the leaves in er, render infection at that season possible, especially in southern and ral districts.

Connection Between the Acidity of the Cell Sap and Rust Resistance in Wheat. — COMES, ORAZIO. Della resistenza dei frumenti alle ruggini. Stato attuale alla questione e provvedimenti. — *Atti del R. Istituto d'Incoraggiamento di Napoli*, series VI, Vol. IX, p. 22. Naples, 1913.

The present work deals with the immunity and susceptibility of differ-varieties of wheat to the attacks of rusts.

The writer first gives a summary of the different results obtained by various investigators on the subject, and then passes on to the fact, which ell known in practice and has been confirmed by experiment, though plausible reason has been put forward to explain it, that nitrogenous ilizers weaken the resistance of wheat to the attacks of rusts.

In a preceding work devoted to the effects of manuring, the writer has wn that though fertilizers stimulate the cells of the plants and cause n to increase both in size and in number, with a simultaneous decrease hickness of the walls, on the other hand they diminish the acidity of cell sap; that is to say that the acidity of the cell sap in various plants n are unmanured, badly cultivated, or in the wild state, will always eater than that in the corresponding organs of manured plants.

With the use of a nitrogenous fertilizer, not only is the size of the organs ased, but a considerable growth of parenchymatous and chlorophyll-uring tissues is obtained. This entails a high starch production and esquent increase in reducing sugars which constitute its mobile form. with the increase of reducing sugars in the sap, the amount of organic s decreases, the different organs lose their acid taste (fruit, leaves , and the gain in sugar is accompanied by a loss of hardness.

It has further been ascertained that acids containing sugar form the media for the development of rusts. It follows that the organs ants treated with nitrogenous fertilizers, which are richer in sugar, are more le to the attacks of rusts. The organs of the cultivated and uncultivated. its which have produced an organ to parasite various parts of the plant. sugars and is present in the cell sap. (admitted undetermined. This is the case with this. 1913. of resistance in organ cell sap.

The writer is convinced that this acidity is the factor which enables plants to resist parasitic fungi, and he states that if wild plants are not more resistant to parasites, but also to injury and attack by physical agents, this circumstance is due rather to the greater acidity of their cell sap than to the greater density and compactness of their tissues. If the so-called hard wheats (*Triticum spelta*, *T. polonicum*, *T. durum*, *T. turgidum* and the related to them) are more resistant than all the so-called soft wheats, it is due to the fact that the production of starch (and therefore of sugar) differs in the two groups: in the former, that of the hard wheats, where the caryopsis is rich in gluten and poor in starch, the sugar production is relatively less than in the case of soft wheats, which have a caryopsis poor in gluten and rich in starch. Therefore with the increase of starch in grain the susceptibility of the latter to rust attacks should increase.

The power of the plants to produce sap more or less rich in sugars and acid must be a specific character and therefore hereditary. Cultivation in general, and the application of manures in particular, exercises an improving influence on the plant, and the degree of improvement attained by the plant is largely controlled by the general conditions of cultivation in which it is subjected. Therefore, by means of domesticating it in different localities, one wild stock will produce different races, and their degree of susceptibility to disease will be intimately connected with the degree of improvement attained by each race in a given environment. And it is always to be found that the organs of the plants which have been most improved are richer in sugars and poorer in acids than the corresponding parts of those whose improvement has not been carried so far.

Together with the acidity factor it has been recorded that a given plant which is resistant in one region retains and frequently increases this characteristic when transferred to a colder region, whether the latter be more southerly or merely at a higher altitude, and *vice versa* loses its resistance in warmer regions. In this connection, it is sufficient to observe what occurs in the case of the vine. The acidity of the wine increases, and its sugar content, and consequently also its alcohol content, decrease gradually as the vineyards rise on the sides of the hills or spread into the more northern districts; and, *vice versa*, the acidity decreases and the sugar and alcohol content increase as the vineyards descend into more southern climes. Consequently a given variety which is resistant in cold or high regions will lose this quality when brought into warmer localities, and according to the author, the variations in its resistance will always be correlated with its sugar and acid content.

The chemical analyses of various plants have confirmed the acidity principle advanced above. For example, the resistance to phylloxera in the case of wheat, which is due to the acidity of the cell sap, is lost when the wheat is crossed with a soft wheat, which is poor in acid.

The first thing to be done in the case of the soft wheats is to cultivate them in a more southerly region, or to cross them with a hard wheat, which is rich in acid. Rieti proves that the resistance of the plants is directly proportional to the acidity of the cell sap.

other kinds grown under similar conditions. Comparative tests were made out at Rieti and in a much warmer locality (the plain of Apulia) which led to the following conclusions:

a) In Rieti wheat the cell sap is more acid than that of other varieties of wheat grown under similar conditions in the districts of Rieti and Foggia.

b) The acidity of the cell sap, though maintaining almost the same amount, decreases in all varieties grown in the plain of Apulia, i. e. in a warmer place than Rieti.

Taking these facts into consideration, the agriculturist should confine himself to biological means in order to increase the resistance of improved plants, i. e. to hybridisation and selection. By these means only he can discover the most resistant varieties for a given district. Further, he must not diminish the plants' power of resistance to parasites, it is necessary to remember that the application of nitrogenous manures (especially dung), while being the most direct method of improving the crop by stimulating the development of parenchymatous tissues, at the same time increases the sugar content of the sap and thus renders the plants an easier prey to parasites. In order to preserve the highest degree of acidity in the cell sap and at the same time to maintain the fertility of the soil, nitrogenous manures should be avoided, and phosphatic fertilizers, especially superphosphates, should be used in their place.

- **Methods of Obtaining "Wetting" Fungicides** (1). — VERMOREL, V. and DANTON, E. Sur les bouillies fongicides mouillantes. — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, First Half-Year, Vol. 156, No. 19 (May 13, 1913), pp. 1475-1476. Paris, 1913.

The researches of the writers have proved that all cupric washes can be made dry and economically rendered adherent, in the case of vines, by adding gelatine (3 to 8 oz. per 100 gallons) to acid washes, or b) an equal amount of casein, dissolved in milk of lime, in the case of washes with an alkaline reaction.

- **Anthraxnose of Sisal Hemp.** — SHAW, F. J. F. in *The Agricultural Journal of India*, Vol. VIII, Part I, pp. 66-68, plates XVI-XVIII. Calcutta-London, 1913.

The writer records that in various parts of India the leaves of *Agave la var. Sisalana* (the well known textile plant) have been extensively seriously injured by a disease which he calls "Anthraxnose of Sisal Hemp." According to investigations conducted on the spot, the disease is due to *Colletotrichum Agave*, described for the first time by Cavara in 1911, as occurring on the leaves of *Agave* in Lombardy.

Using infected material the writer has obtained pure cultures of the fungus and succeeded in reproducing the disease artificially. The *Colletotrichum* in question is a very common fungus, and as it is not unusual to find it on the leaves of *Agave*, it is especially after

a period of hot dry weather, it is easy to understand that infection may take place through such breaks in the superficial tissue.

Collecting and burning diseased leaves and spraying with Bordeaux mixture are measures advocated by the writer for checking the disease.

884 - Lime-Sulphur Wash for American Gooseberry Mildew (*Sphaerotheca mors-uvæ*). — SALMON, E. S. and WRIGHT, C. W. B. in *The Journal of the Royal Horticultural Society*, Vol. XIX, No. 12, pp. 994-1004, London, 1913.

Different varieties of gooseberries differ to a marked degree as regards the susceptibility of the foliage to injury from the lime-sulphur wash. With some varieties, e. g. May Duke, it is possible to spray throughout the season with lime-sulphur sufficiently strong (1.01 sp. gr.) to prevent attacks of American gooseberry mildew without causing any injury to the foliage; it is probable that, at least with some varieties, the young foliage will prove resistant to injury from the lime-sulphur wash at the beginning of the season (May) while showing susceptibility later in the year. This is of practical importance in controlling the disease, since it is also in May and the early part of June that spraying will prove most efficacious by preventing the first infection of the season due to the germinating ascospores and the subsequent rapid spread of the parasite by means of conidia.

Under ordinary summer weather conditions, the strength of the lime-sulphur wash should be as follows:

For Whinham's Industry, Rifleman, Warrington and May Duke: 1.01 sp. gr.

For Lancashire Lad: 1.005 sp. gr.

For Crown Bob: 1.005 sp. gr. used early in the season only, as late use may cause some injury.

For Berry's Early: 1.005 sp. gr. early in the season and when the bushes are more or less shaded; later in the season the wash damages the foliage even when used at lower concentrations.

Valentine's Seedling and Yellow Rough varieties show so marked a susceptibility to injury that the lime-sulphur wash should not be used on them at all. Until further experiments have been carried out the best strength wash (1.005 sp. gr.) should be used and the spraying done on an experimental scale.

855 - Fungus Diseases of *Hevea brasiliensis* and *Butyrospermum Parkii*. — GRIFFON, ED. and MAURICE, A. Sur quelques champignons parasites des plantes. — *Bulletin trimestriel de la Société mycologique de France*, Vol. XX, Part 2, pp. 244-249, Paris, 1913.

P. Hennings (1914) under the name *Dothidea* *Ulei* a fungus which he described as *Ulei* (the rubber plant) collected in the Malay Peninsula. The writers have recently discovered that this fungus is the same as the one described by Hennings. The plant which he described by him as *Ulei* is a species of *Ulei* which belongs to the genus *Ulei*.

ers do not share. They observed some stromae containing both asci (gemmature) and spermatia unlike those of *Aposphaeria* and finally found, on the lower surfaces of some leaves, a conidial form of the *Scolecotrichum* type which was without doubt connected with *Dothidella*. The investigators consider that the latter, in its different fruiting forms, may be a leaf parasite of *Hevea*, but not the cause of any serious disease. On adult trees the injury is practically negligible; plants in a nursery, such as were used as the subjects of investigation, may, on the other hand, suffer considerably from the attacks of this cryptogam.

The writers then describe a disease which affects another useful tree, *Prosopium Parkii* (1), concerning the cryptogamic diseases of which there was, so far, apparently no information. They observed in the first place upon infected leaves gathered in the neighbourhood of Kulikoro (Upper Volta and Niger), a fungus which they consider to be new and describe under the name of *Fusicladium Butyrospermi*. Finally, on a few leaves they discovered old and completely empty conceptacles (pycnidia or thecia), and in addition to these the fructiferous organs of a *Pestalotzia*, which they describe as new (*P. heterospora*). The latter had apparently eloped saprophytically on the patches produced by the first fungus. The writers have no information as to the conditions under which the two ve-mentioned diseases were developed nor as to the injury (probably significant) which they caused.

- *Asterina* sp. on the Leaves of Maté in Argentina. — LENDNER, A. Un champignon épiphyllé des feuilles d'*Ilex paraguariensis*. — *Bulletin de la Société botanique de Genève*, Second Series, Vol. II, No. 1, pp. 34-35, fig. 3. Geneva, 1913.

In the summer of 1912, the writer received from Rosario (Argentina) some leaves of Maté (*Ilex paraguariensis*) on both surfaces of which were black spots due to the presence of a superficial fungus; this was a species of *Asterina* (Perisporiaceae). It appears only here and there in the tea plantations, but covers all the leaves of any tree which it attacks. On the lower surface of the leaf the fungus forms a somewhat regular black network, while on the upper side it appears under the form of black spots 0.2 mm. in diameter. The disease does not appear to harm the leaves, its presence nevertheless detracts from the value of the product.

- *Endothia pseudoradicis* n. sp. on the Chestnut in Italy. PETRI, L. Sopra una nuova specie di *Endothia*, *E. pseudoradicis*. — *Rendiconti delle sedute della Reale Accademia dei Lincei. Classe di Scienze fisiche, matematiche e naturali*, 1913, Vol. XXII, First Half-year, Part 9, pp. 653-658, figs. Rome, 1913.

In the early part of 1912, at Torre del Lago (Livorno), near Cascaglia (Lucca), the writer found at the base of some chestnut trees old numerous fructifications of an *Endothia* which he gives only a description for *E. pseudoradicis*. The

chestnut poles in question had sprung from the stump of a tree which been felled in the hope of saving it from the ink disease.

E. pseudoradicatis shows the closest affinity to *E. virginiana* And., differs from the latter in the nature of the walls of the perithecium, and more closely resemble those of *E. parasitica* (Murr.) And.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

388 - Wintering of Dodder in the Vegetative State. — MORETTINI, A. in *L' Agricoltore*, Year I, No. 10, pp. 245-248, Plate. Piacenza, May 30, 1913.

Lazionow in one of his recent works(1) has stated that dodder (*Cuscuta*) is an annual plant; the opinion of other investigators is divided, some maintaining that it cannot survive the winter, while others doubt this assertion. On the other hand, investigations made in Italy by Benvenuti (1844) Peglion (1909) showed that dodder in a vegetative condition can resist winter temperature of 5° and 7° C. and grow luxuriantly on the return spring.

The writer, who is convinced that the question is of great importance, regards to the means adopted for destroying the parasite, considered in view of the uncertainty which prevailed on the subject, it would be useful to see how this plant behaved under the climatic conditions of Umbria.

The experiments were begun in the summer of 1912 in the experimental field of the Royal Institute of Experimental Agriculture at Perugia on a three-year-old field of lucerne in excellent condition of vegetation and in which all possibility of dodder infection by means of seed was excluded. The results (in March 1913) showed that, as had already been shown by Benvenuti and Peglion, this parasite is capable of wintering in a vegetative condition, i. e. can reproduce itself from year to year without necessarily forming seeds. This proof should suffice to convince farmers that if a field is infected in the summer, unless measures are taken for the destruction of both the host-plant and the parasite, the latter will preserve its vitality throughout the succeeding winter and subsequently develop luxuriantly. Repressive measures carried out in winter are thus advisable in the case of summer and autumn invasion of the pest; these consist in cutting off the infected plants 1 to 3 cm. below the surface of the soil either with a spade or, better still, with a sharp hoe. All the cut plants should be burnt on the spot, or if removed elsewhere for destruction, this should be done with the greatest care. It is best to begin the work in the middle of May, before beginning the sowing of the lucerne, and it is necessary to carry it out before working the soil. In the case of winter invasion, the host-plants begin to show leaf, as the dodder is already in the soil, and it is difficult to distinguish the plants.

***Senecio vernalis*, a Troublesome Weed in the Rhenish Palatinate.** — Wäster. Das Frühlingskrenkraut (*Senecio vernalis*) in der Pfalz. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, Part 5, pp. 70-71. Stuttgart, May 1913.

This groundsel made its appearance in the eastern provinces of Prussia towards the beginning of last century — it was first observed in 1822 — and very soon spread to nearly all the German States. It is a vegetative period of two years, and as it passes the winter as a biennial it is very difficult to eradicate from any spot where it has established.

It was recorded as occurring in the Palatinate as far back as 1906, when it made its appearance in the district of Ludwigshafen, whence it spread to a large part of the surrounding country. In 1908 it was found near Hassloch and Böhl growing in a field of lucerne.

Wherever it has not been kept in control by severe repressive measures, this weed has spread to such an extent that it has got quite out of hand, and it is no uncommon thing to see whole clover fields transformed into a sheet of yellow owing to the large numbers of plants present. It also invades the woods whenever it finds the conditions necessary for its existence.

The writer also maintains that, contrary to general belief, this weed is not to be feared in clover leys on arable land, since according to his investigations the seeds of *Senecio vernalis* retain their germinative power for some years. He therefore recommends the immediate adoption of repressive measures.

INSECT PESTS.

The Formation of a German Society of Applied Entomology. — Communicated to the International Institute of Agriculture.

During the meeting of the German Zoological Society — which took place at Bremen from May 12 to 15, 1913 — at the initiative of Prof. K. Thierich of Tharandt (Saxony), a German Society of Applied Entomology (deutsche Gesellschaft für angewandte Entomologie) was formed. The object of this society is the formation of a suitable government organization for the purposes of scientific investigation, and of the control of insects which are economically harmful, or disease-carriers, and for dealing sympathetically with the scientific material collected, and making known the practical importance of this subject.

On the Presence of *Icerya perniciosa* and *Icerya cardinalis* in the Maritime Alps (1). — VUILLET. *Revue entomologique de France*, 1913, No. 7, pp. 164-165.

In the summer of 1912, the writer was introduced into an estate in the peninsula of Corsica, where he found these two species within two days.

(1) See also *ibid.*, 1913, No. 10, p. 215.

years it spread greatly in the neighbourhood, especially on *Acacia*, *Rosa*, *Pittosporum*, *Choisya* and *Citrus*. In the summer of 1912, *Novius cardis* was successfully reared and acclimatized; this ladybird is the principal natural enemy of the injurious scale insect in question.

At the present time, it is easy to find *Novius* in all stages of development in the zone invaded by *Icerya*.

- 892 - *Cocobacillus cajae* n. sp., a Parasite of the Larvae of *Arctia* in France (1). — PICARD, F. and BLANC, G. R. Sur une septicémie bacillaire chenilles d'*Arctia caja* L. — *Comptes rendus hebdomadaires des Stances de l'Académie des Sciences*, 1913, First Half-year, Vol. 156, No. 17 (April 28, 1913), pp. 1334-1335, Paris, 1913.

The larvae of *Arctia caja*, which are numerous this year in the vineyards of the South of France, have fallen victims to two diseases: one, which has been known for some time, is due to *Empusa aulicae* Reich.; the other is of bacterial origin. The dead larvae become flaccid and exhale a nauseous odour; their alimentary canal is devoid of its usual contents and is filled with a clear liquid, often free from any microorganism. In cultures, the blood contains a *Cocobacillus*, for which the writers propose the name of *C. cajae*, and by means of which they have artificially induced the disease. It is distinguished from *C. acridiorum* Hér. by several biological and pathological characters (2). As the experiments made have shown the possibility of infection through the mouth, it has been hoped that the new *Cocobacillus* may be of practical use.

- 893 - New Peruvian Parasites from *Hemichionaspis minor* (Hym.). — RUSCH, E. W. in *Entomological News*, Vol. XXIV, No. 4, pp. 160-165, Philadelphia, 1913.

A systematic description of *Prospaltella peruviana* n. sp., *Signiphora* n. sp. and *Neosigniphora nigra* n. gen. et sp., parasites of the "piojo blanco" (*Hemichionaspis minor* Mask.), a scale infesting *Gossypium peruvianum* (native or tree cotton) in Peru.

- 894 - Experiments in the Control of Wireworms. — KAREL, M. Zur Drahtwurmbekämpfung. — *Fühling's Landwirtschaftliche Zeitung*, Year 62, Part 9, pp. 31-32, Stuttgart, May 1, 1913.

In 1912 a series of experiments was undertaken at the Dresden cultural Experiment Station on the control of wireworms (*Agriotes lineatus* larvae) which do a lot of harm to the crops every year. Of the numerous methods tried, only three can be recommended for practical purposes: a) placing in the ground half potatoes to serve as a bait for the larvae; b) repeated rolling of the ground; c) the use of nitrate of soda, nitric lime or kainit.

Aphis papaveris Injurious to Beets in Northern France (1). — MALA-
 C, A. and MORRIS, A. Le puceron de la betterave dans le Nord de la France. —
Revue Agricole et Rurale, Year 2, No. 24, pp. 696-699, 7 figs. Paris, May 17, 1913.
 During the last few years, and especially in 1911, *Aphis papaveris*
 appeared in large numbers in Northern France, where it has done
 damage to the beets. The investigations made by the writers in that
 confirm those of the Russian entomologist Mordwilko, who
 states that *Aphis papaveris* of beets is the aphid found in spring
nymus europaeus, whence its name of *A. evonymi* Fb. This insect also
 on different species of *Rumex*, to which it owes its synonymy
icis L.

On the life cycle of this insect which is given briefly in the article,
 states that during the latter part of the autumn and throughout the
 and early spring, i. e. from October to the end of April, these aphides
Evonymus and the females deposit on this plant the eggs which give
 the founders of next season's generation. Owing to this circumstance
 preventive measures against the pest can be both offensive and defensive,
 possible to kill the parasites on *Evonymus* and by destroying the winter
 and the spring brood decrease the number of individuals which
 otherwise swarm on wild or cultivated plants. In order to do
 would be well to eradicate entirely *Evonymus* in beet-growing
 s; but in any case, it is indispensable that the insects infesting
 herbs should be destroyed in March, April and May and also, if
 15, in October.

The writers consider that preventive measures are preferable to remedies,
 spraying, which is only useful when the beets are already attacked
 besides a costly operation and only temporarily efficacious.
 Rather the assistance of some entophagous Hymenoptera may be re-
 medied; this measure was adopted in 1912 with the result that over
 cent. of the aphides were destroyed, and the writers propose to con-
 their investigations in this direction.

**New Insect Pest on Roses: The Vine Curculio (Weevil) (*Orthor-
 nus Kluggi* Sch.).** — FRENCH, C. Jun. in *The Journal of the Department of Agri-
 culture of Victoria, Australia*, Vol. XI, Part. 4, pp. 240-241, 1 fig. Melbourne, April 1913.
 This insect, whose natural food is the wattle (acacia), is common
 in parts of the State of Victoria. Of recent years it has done much
 to the vines, and in 1909 it was found on the terminal twigs of Jo-
 apples and apricots while now its larvae begin to attack roses also
 cause the death of the stems. As these pests deposit their eggs
 exterior of vines and roses, the writer advises spraying the plants
 with a deterrent such as coal tar which he formulates as follows:
 1 lb. of coal tar in 2 gallons of water. Add from 50 to 100
 of water. All dead or
 acacias growing there should be destroyed
 ning.

INJURIOUS VERTEBRATES.

897 - Results of Experiments on the Control of Field Voles in France.
Feuille d'Informations du Ministère de l'Agriculture, Year 18, No. 16, p. 1. Paris.

For reasons which are not very clearly defined, the experiments with Danysz virus have given unequal and often insufficient results.

Another poison named "ratin", made in Paris by Dr. de Christy, is being tested for the Ministry of Agriculture in Charente Inférieure (near La Jarrie), on an area of over 30 000 acres.

The Special Commission sent by the Ministry to examine on the irregular action of this second remedy, although including it among the methods of controlling field voles, decided that until the cause of the uncertain action of this virus is scientifically determined, it cannot be the general use of "ratin".

(1) See No. 1567, B. Nov. 1912.

